TECHNOLOGY DEPT.

APRIL, 1953

Telephone and Management Engineer

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THE NATIONAL TELEPHONE MAGAZINE

Featuring In This Issue—

- **Finding Troubles Before They Happen, by G. Robert Knell**
- **Getting Right-of-Way The Right Way, by John B. Henkels**
- **New Construction Methods, by John S. Reed**
- **Modern Circuit Testing Methods, by Richard Allen**

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Telephone Engineer and Management

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APRIL, 1953 VOL. 57, NUMBER 4

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FRONT COVER

Wisconsin Tel. Co. Cable Splicer, Kenneth J. Barry, Milwaukee, demonstrates new method of repairing separated binding posts in terminal boxes. New system uses arc-welding principle. — (Wisconsin Telephone Co. Photo.)

Published monthly by Telephone Engineer Publishing Corp. 7220 Sheridan Road - Phone Rogers Park 4-3040 - Chicago 26, Illinois.

Volume 57, Number 4. Published monthly by Telephone Engineer Publishing Corp. Office of Publication, Rochelle, Ill. Executive and Editorial Office, 7720 Sheridan Road, Chicago, Ill. Subscriptions: U. S., Cuba, Mexico, $3.00 per year; Canada $3.50 in all other countries, $5.00. Single copies, U.S.A. 35 cents. Entered as second class matter at the post office at Rochelle, Ill. under the act of March 3, 1879.

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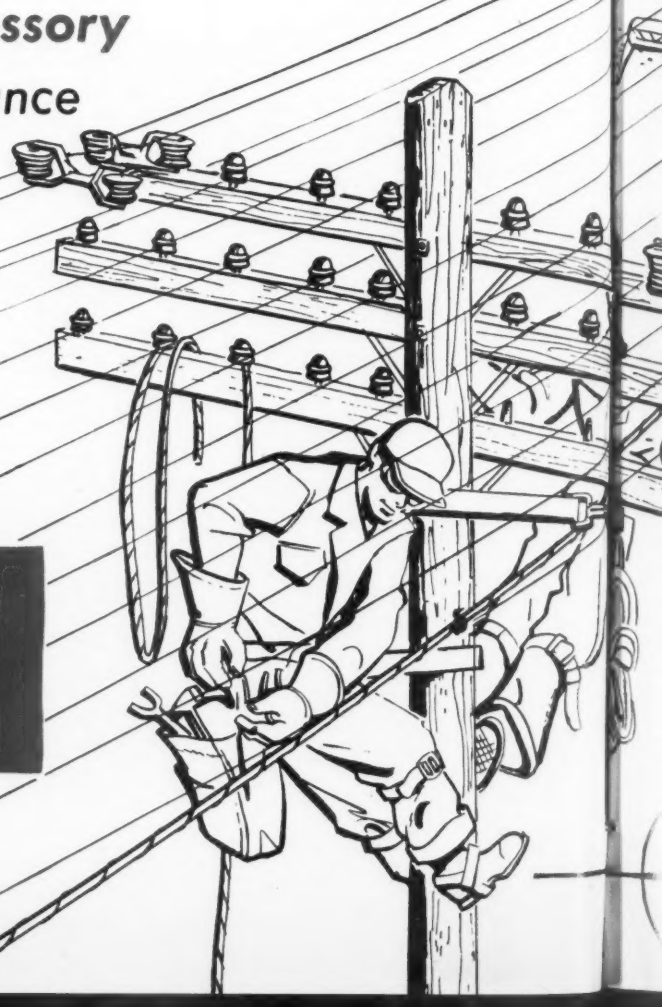

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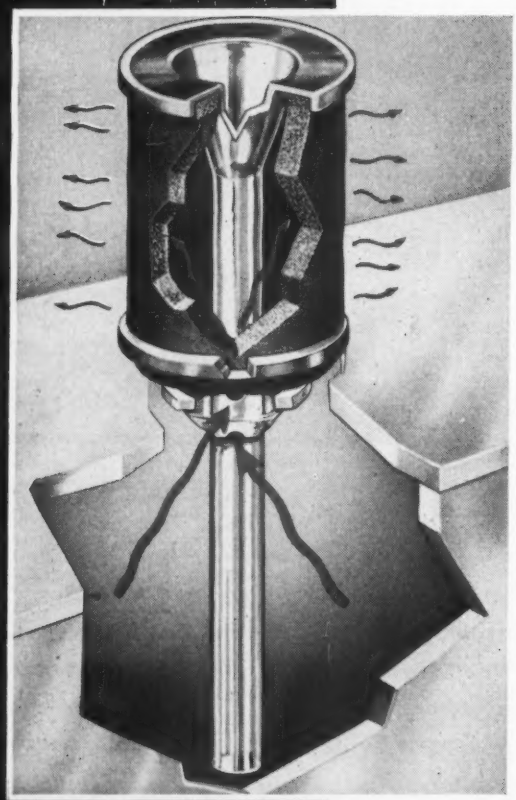

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ON THE 1st OF EACH MONTH ON THE 15th OF EACH MONTH
NEWSLETTERS *on Alternate Weeks*

April 15, 1953

Dear Sir:

Motions authorizing an additional $10,000,000 telephone loan fund for REA during remainder of fiscal 1953 were rejected by House Mar. 19, in action on appropriations bill conference report. Transfer of money from electrification loan authority was turned down on basis that REA should be granted $10,000,000 in new money, but such request then also was rejected by Congressmen.

* * *

Pres. Eisenhower sent to Capitol Hill on Apr. 2 his reorganization plan which would make Office of Defense Mobilization (ODM) permanent government agency with broadened functions. Under plan, ODM would take over functions of National Security Resources Board & stockpiling authority now held by Munitions Board in Department of Defense.

* * *

United Tel. Co. of Pa., Harrisburg, & New Jersey Tel. Co., Flemington, received FCC classification as connecting carriers. Companies had never formally been classified as connecting carriers. United of Pa. operates more than 60,000 telephones. New Jersey company operates over 10,000 stations.

* * *

China (Formosa) has been authorized to spend $200,000 for purchase of communications equipment in purchase approvals announced by Mutual Security Agency. Equipment is to be used by Chinese Nationalist Army Signal Corps.

* * *

Present excise taxes on communications services are "inimical to the maintenance of a reasonably priced and nondiscriminatory public communication service" Nevada Legislature declared recently in resolution placed in Congressional Record by Senator McCarran (D., Nev.). Resolution pointed out that Congress has repealed tax on electrical energy, & noted that "communications services cannot be considered in the class of luxury, yet are taxed higher than most luxuries."

* * *

Quick decision on application of Southwestern Bell Telephone Co. for authority to acquire 27 exchanges of Western Light & Telephone Co., as part of transaction in which Western Light & Telephone would receive 9

exchanges, was handed down March 30 by FCC Examiner Annie N. Huntting, only two business days after the hearing was held.

Mrs. Huntting, approving transaction, held that proposed transfer "should result in benefits to the telephone users since it appears that more cohesive, integrated operating units, producing greater efficiency and economy, should result . . . In some instances, service will be expanded and improved. Both (Southwestern Bell) & Western are financially and technically qualified to render service in the exchanges they are acquiring of a quality equal to that being presently rendered."

The decision is effective in 40 days, if no exceptions are submitted or objections raised.

An official of Western Light & Telegraph said FCC approval of transfer should improve its telephone earnings in 1953. For last year, telephone revenues amounted to $2,178,300, increase of $164,000 over 1951. Western Light also announced plans to spend nearly $7,000,000 this year for additional facilities, to bring capital outlay since end of World War II to $19,000,000.

* * *

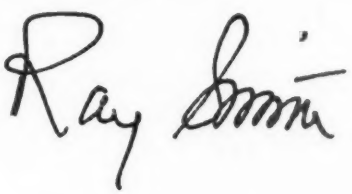
Eisenhower administration, through Budget Bureau Director Joseph M. Dodge, has reduced FCC funds for 1954 fiscal year as proposed under Truman budget, sent to Congress before inauguration, from $8,005,300 to $7,105,300, it was disclosed in hearings before House Independent Offices. Appropriations subcommittee, which were released April 6.

FCC Common Carrier Bureau activities, under recommendations of Budget Director Dodge, would receive allotment of $775,000 for next (1954) fiscal year beginning July 1, 1953, & this was only FCC function which did not receive slash from Truman budget estimate. Budget Bureau stated that in its review of FCC's 1954 program, it made no reduction in common carrier activities because it felt this function of FCC had been reduced so substantially over past few years & problems in its sphere of activity had become so acute that previously submitted budgeted amounts should be permitted to stand. Even with this allotment, FCC emphasized that it will be able to do only minimum job in this field.

* * *

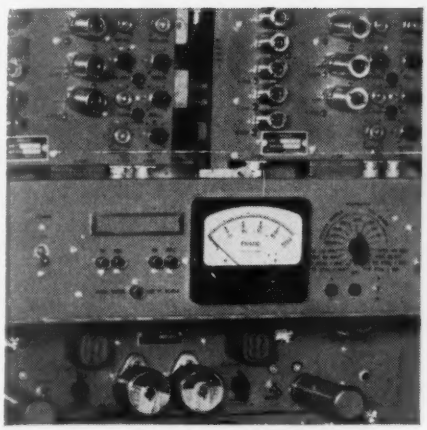
Walter G. Wright, vice pres. of General Telephone Co. of Southwest, has been named pres. of company, effective May 1. He succeeds Roy Autry, who will assume new duties as consultant on operating problems for General Telephone System, largest group of Independent operating companies, with well over 1,500,000 telephones.

At annual stockholders' meeting, held just prior to Board of Directors' meeting at which Mr. Wright was named pres. of company, Herbert L. Nichols, chairman of the Board of Southwestern Pulic Service Co., & director of parent General Telephone Corp. since 1936, was elected to General of the Southwest Board. He succeeds Walter L. Posey of Lubbock, Tex., who resigned. All other directors & officers of company were reelected.



Ray W. Smith, Editor

PHILCO MICROWAVE CUTS COMMUNICATIONS COST



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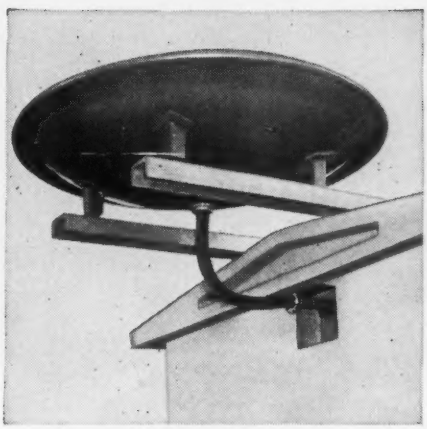

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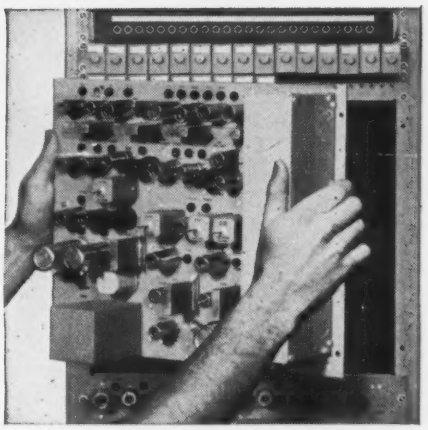

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That is why Philco microwave is built to Joint Army-Navy Specifications and why Philco's exclusive design slashes field maintenance time with built-in metering and test points on all major circuits . . . eliminates tower-climbing for routine checks with passive reflector-antenna system...allows quick field replacement of major assemblies with Philco's exclusive "packaged unit" components, removable with only a screwdriver.

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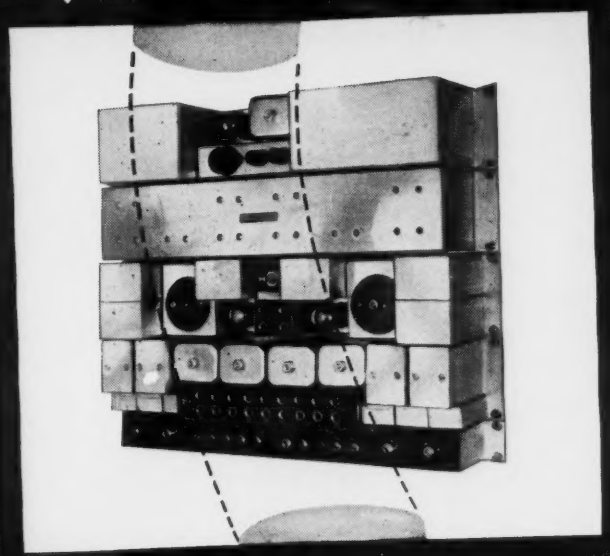

Here's the ideal, low-cost solution to many a circuit problem where transmission level is "below commercial." . . . Far less costly than replacing wire, the KELLOGG Repeater has often provided the necessary gain. In one case, where replacement with .104 copper wire to provide a 4.5 db circuit was suggested, at a cost of from $12,000 to $18,000.00, a KELLOGG Repeater provided a gain of 14 db which resulted in a better circuit—and at less than 5 per cent of the cost of installing new wire! . . . It will pay you to GET THE FACTS about KELLOGG Repeater. Fill out and mail the coupon below TODAY!

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Gould-National Batteries, Inc.
W. A. Hammond Drierite Company
Indiana Steel & Wire Company
Kester Solder Company
Lorain Products Corporation
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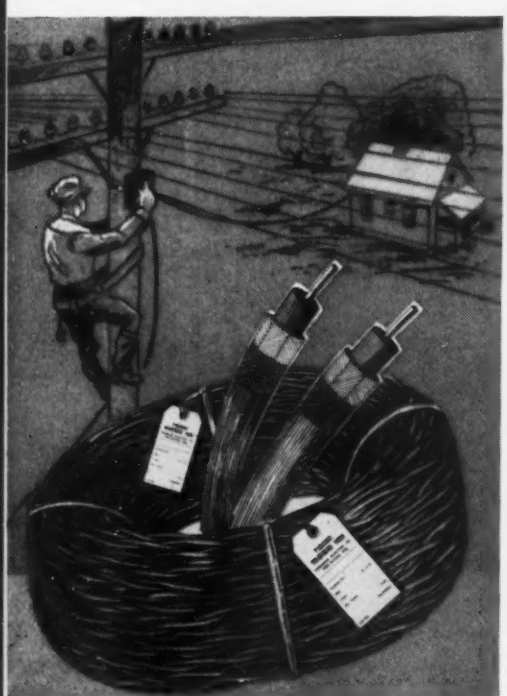

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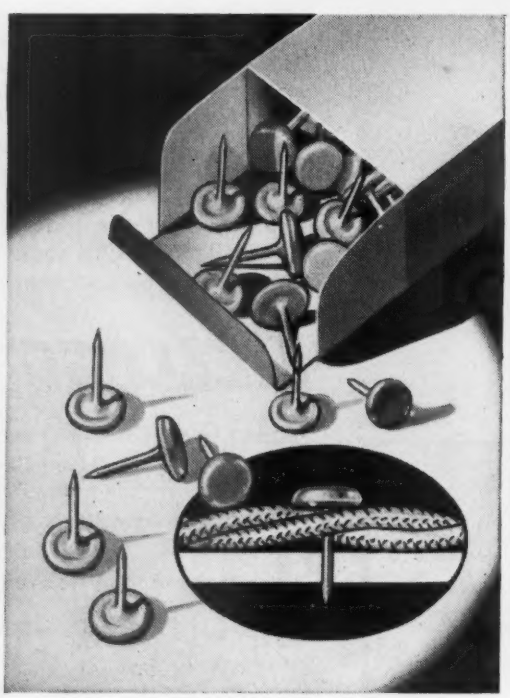

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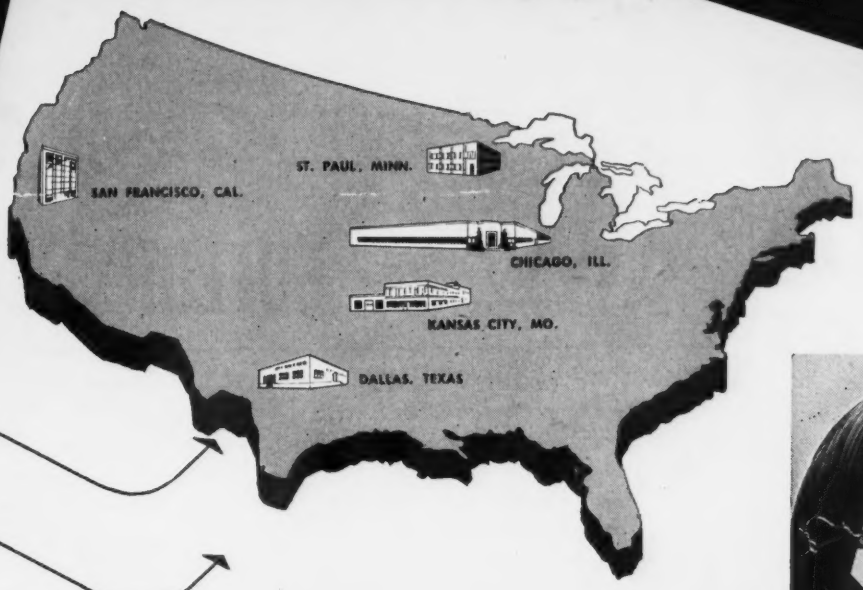

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Insto-Gas
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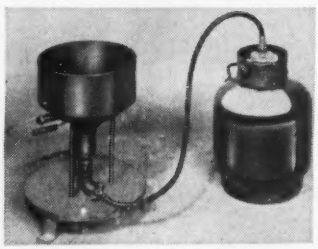

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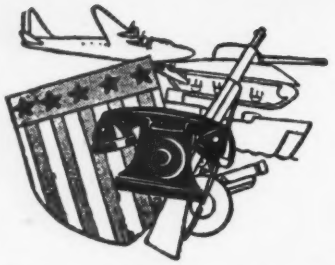

Across The EDITOR'S DESK

THE INDEPENDENT Telephone Men's Committee for Tax Equality, a special committee of the National Tax Equality Association, has issued another folder especially prepared for tax-conscious telephone men. The title of the folder "Opening the Flood Gate Wider" is offered free to all telephone men who will request them by writing to the association at Suite 1027, 231 S. La Salle St., Chicago 4, Ill. *Col. Wm. C. Henry*, pres. and gen. mgr. of the Northern Ohio Telephone Co., Bellevue, Ohio, is Chairman of the group sponsoring these folders.

MR. AND MRS. R. B. MARSHALL, of Bradley, Okla., have spent a lifetime in Independent Telephony. They were owners of a tip-top magneto exchange, housed in their own comfortable six-room home. They thought of the effort which had given their business equity, and counted their blessings.

On Saturday, March 14th, they could only be thankful they were still alive—nothing else had been spared. Roaring out of the west without warning, a tornado struck and reduced their home and plant to matchwood. Mr. and Mrs. Marshall took refuge in their cellar, and thus escaped with their lives—and all their plans, their hopes and dreams crashed over their heads.

Southwestern States Tel. Co. (Purcell Division) rushed aid to the scene, but the plant was so completely destroyed that only one temporary pay-station line could be set up.

We are certain that the traditions of Telephone People will come to the fore in Bradley as it has everywhere else when disaster has struck. To Mr. and Mrs. Marshall goes the hope of all Independent owners for the strength to rally from this crushing blow. (Thank you Frank Micka for this report. Ed.)

THE ROBBS (A. L. & D. M.), the father and son combination running the Electra (Tex.) Telephone Co., issued invitations for the company's 45th Anniversary Open House late in March. The Open House was held April 12 and provided the first view to the public of the new automatic equipment in the new building.

CONGRATULATIONS to the *Texas Telephone Association* on its record-breaking convention in Dallas during March. By noon of the first day over 530 had registered to break all modern-day attendance records.

Telephone Engineer

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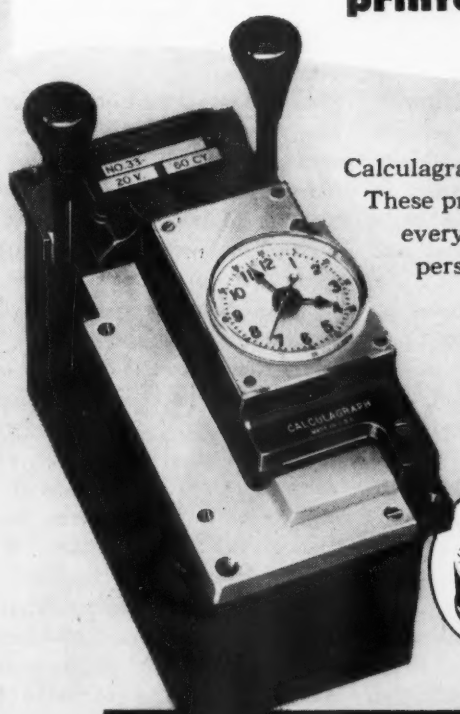

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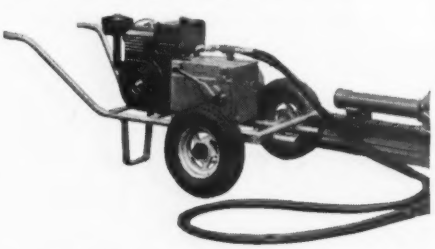

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Washington Bureau Reports

By ROLAND DAVIES and FRED HENCK

John C. Doerfer named FCC Commissioner . . . Ancher Nelson to succeed Claude R. Wickard as REA Administrator.

THE first appointment to the Federal Communications Commission by a Republican President in the agency's 19-year history has turned out to be one of the most outstanding made since the Commission's inception.

In one of the few such nominations since the FCC was launched in 1934, President Eisenhower has named a state commissioner experienced in public utilities regulation—Chairman John C. Doerfer of the Wisconsin Public Service Commission. Many appointments to the Commission in the past have been geared principally to broadcasting interest and experience.

Mr. Doerfer's speedy approval by the Senate Interstate & Foreign Commerce Committee, and prompt endorsement by the Senate itself, was anticipated as this column was written.

The FCC Commissioner-designate has actively supported the Republican ticket nationally and in his state. He was named to the state commission in 1949. After election as Chairman by his fellow Commissioners, he later was named Chairman by the Governor after a reorganization statute vested that authority in the state's chief executive.

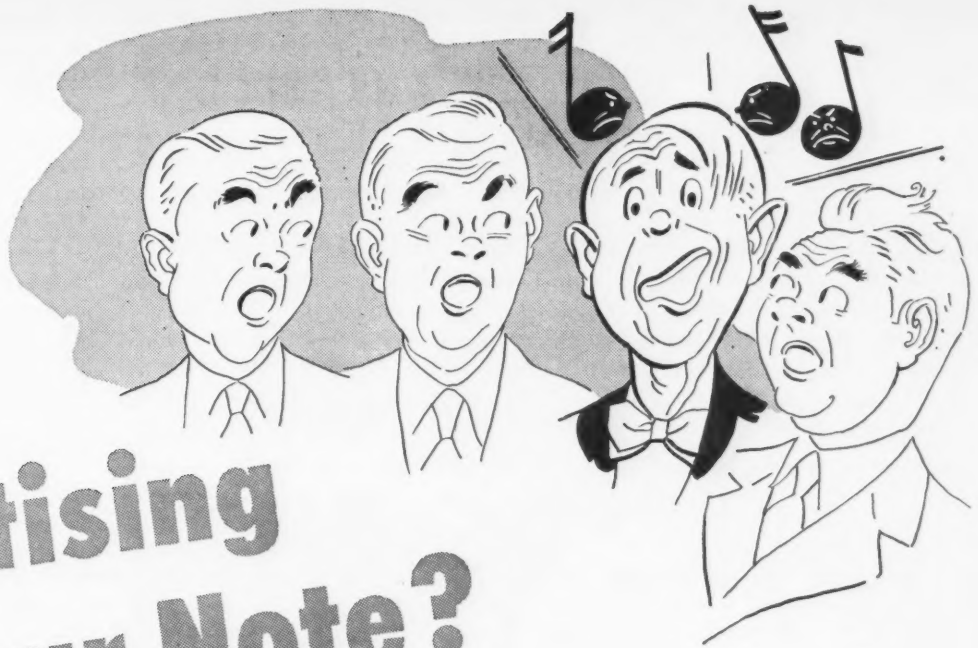
Wisconsin Chairman Doerfer, who was City Attorney of West Allis, Wisc., for nine years before his selection as a state Commissioner, is highly regarded for his character and ability. He is known in state regulatory and National Association of Railroad & Utilities Commissioners circles for his fundamental belief in private enterprise and its benefits to the nation in all types of business and industrial activities, and particularly in the public utility and communications fields. He has voiced these views in a number of magazine articles and addresses on utility regulation,

Commissioner-designate Doerfer has experience both in accounting and law. Before his admission to the Wisconsin bar and entry into the practice of law, he had served as an accountant with several firms in West Allis for about six years.

Meanwhile, there was no definite indication as to the identity of the first Republican Chairman of the FCC. He could be Vice Chairman Rosel H. Hyde, or Mr. Doerfer, or the unidentified Republican who will succeed to Chairman Paul A. Walker's term, which expires June 30. Conceivably, Chairman Walker's service could be terminated before that date, either by resignation or withdrawal by President Eisenhower of the executive order permitting Chairman Walker to serve beyond the mandatory federal retirement age of 70.

Future of REA

THE SHAPE of things to come for the Rural Electrification Administration's farm telephone program under the Eisenhower adminis-



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tration is gradually being made clear.

Highly significant, of course, is the appointment of Ancher Nelsen, Lieutenant Governor of Minnesota, as the new Rural Electrification Administrator, to succeed Claude R. Wickard.

Mr. Nelsen is an experienced farmer, who has operated a 280-acre farm near Hutchinson, Minn., since 1924. He also is a veteran Republican, who served as state Senator for eight two-year terms until his selection last fall as the Lieutenant Governor of the state.

The appointment of Mr. Nelsen hardly came as a surprise. It had been generally accepted since Mr. Wickard's resignation that he would get the REA post, and in fact it is known that he was offered the assignment several weeks before Mr. Wickard reluctantly submitted his resignation.

Meanwhile, broad powers to reorganize the Agriculture Department and establishment of clearer lines of responsibility were asked on behalf of Secretary Ezra T. Benson by the Eisenhower administration, but no wholesale change in REA's structure is likely. The reorganization plan is subject to veto by either House of Congress, and is designed to vest functions directly with department heads. President Eisenhower, in submitting the proposal, called the present makeup of the department a "patchwork."

Secretary Benson made his views about REA's telephone program more clearcut when he submitted to the House Appropriations Committee a $141,400,000 reduction in the $1,325,200,000 budget for his department for fiscal 1954 submitted by ex-President Truman before he left office in January.

Proposing a $50,000,000 farm telephone loan fund for the fiscal year beginning July 1, instead of the $65,000,000 recommended in the Truman budget, Secretary Benson noted that the amount asked is an increase of $15,000,000 above 1953, and "will provide for a reasonable expansion of the program."

The statement continued, "The job of providing high quality rural telephone service in rural areas not now adequately served is a big and difficult job that we should approach with care and assurance that every loan is economically sound, adequately secured, and in the long run beneficial to the users.

"Whether total requirements are met over five or 10 years, or over a much longer period of time, is a matter of administrative and Congressional planning. It is believed that the most economical and efficient way of administering a rural telephone program is to provide a relatively stable authorization, rather than to permit wide variations in the loan funds available from year to year.

"Such a program will permit the training and maintenance of an adequate, well-trained technical staff to handle the work in the most economical and efficient manner."

The budget revisions submitted by Secretary Benson call for $7,775,000 in administrative funds for REA, compared with the present level of $8,288,000 for fiscal 1953, and the $9,000,000 proposed by ex-President Truman. The entire cutback of 50 jobs, compared with the present level of employment, would come from the electrification program, with no change in the number of telephone staff members.

We're Working for Uncle Sam, Too!

We're proud to do our part in the defense program. The Neale Construction Company has been chosen by the Government for a number of outside plant construction jobs. And we have bent every effort to complete all our defense assignments in record time.

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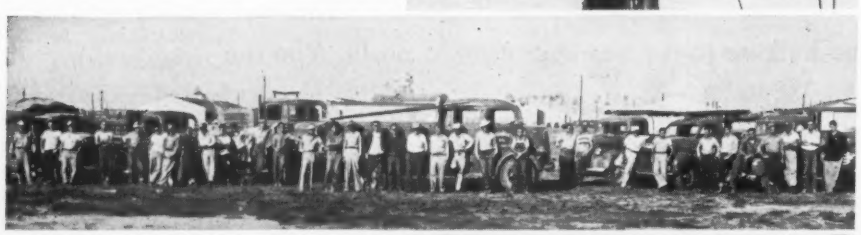

These fine Signal Corps photographs show the men and equipment of the Neale Construction Company on th job at Fort Hood, Texas. Top picture shows the Neale Cable Spinner in operation. Center shows the full complement of Neale personnel assigned to the job. Bottom shows a crack Neale crew and their modern construction equipment.

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EDITORIAL

REA Goes Under New Management

WITH THE RESIGNATION March 16, effective immediately, of Mr. Claude R. Wickard as Administrator of Rural Electrification Administration, REA went under new management. This time, for the first time, under Republican management.

Just what this change in management will mean to the telephone industry, to telephone company borrowers from REA, and to telephone co-ops, existing and prospective, cannot of course be known until the policies of the new management become known.

Mr. Ancher Nelson, now Lt. Governor of Minnesota, has been named by the President as the new REA Administrator. He will take office, it is understood, about May 1. Meanwhile the Secretary of Agriculture is being represented by REA by the temporary appointment of Mr. E. C. Johnson, formerly of the Farm Credit Administration.

It is therefore clear that any new policies made in REA henceforth will be in accordance with the policies of our new Republican government.

It is known that our new Federal Administration is in favor of free enterprise and opposed to government in business.

This would indicate that the new REA Administrator will turn a receptive ear to any complaints industry may have of REA activities unduly favoring the creation of telephone co-ops.

For some months before Mr. Wickard's resignation he and members of his top staff and representatives of the United States Independent Telephone Association held conversations for the purpose of working out a plan for cooperation between the Association and its member companies and REA.

One purpose of the plan was to eliminate disputes or misunderstandings between co-ops or co-op organizers and existing telephone companies. The Association contends that such misunderstandings and disputes arise most frequently from four causes, which are:

Encroachment by REA co-ops on operating territories of existing telephone companies; irresponsible promises by co-op organizers as to free toll service and other services to be provided the co-op by existing telephone companies; creation of co-ops where there is no appreciable demand for them, and purchases by co-ops of existing telephone exchanges as the nucleus for the co-op.

Mr. Wickard expressed himself as being in sympathy with the objectives desired, and suggested a closer liaison between REA field representatives and regional committees of USITA. He thought, too, that it would be advisable for co-op organizers to first ascertain whether an existing telephone company is willing to serve the area, and to discuss and agree upon territorial boundaries.

Mr. Wickard also concurred in the Association's position that when a commercial telephone company is ready and willing to provide adequate service, the company, and not a co-op, should provide the service.

All of this, it seems to us, provides a sound beginning to a plan of helpful cooperation between commercial companies and REA, if each side implements its own part of the plan. The new management of REA should and we believe will go along with, and perhaps even improve on, the plan—and the Association will, beyond doubt, see that it is fully informed about the situation from the standpoint of the commercial companies.

There can be no expectation that, under its new management, REA will be less active in making loans for telephone purposes when such loans are justified.

But there can be expectation that, under its new management, REA will be careful to preserve the rights of the telephone industry, and to curb over-zealous attempts by organizers to create co-ops where they are not needed.

It will be up to the industry to see that REA is informed of such attempts.

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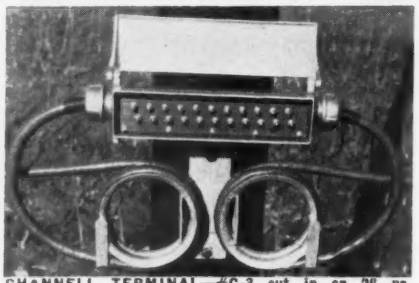

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26-Pr.	26-Pr.	26-Pr.	26-Pr.
51-Pr.	51-Pr.	51-Pr.	
76-Pr.	76-Pr.		
101-Pr.			

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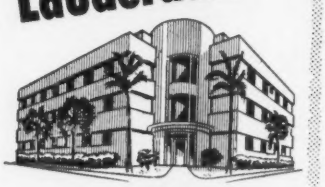

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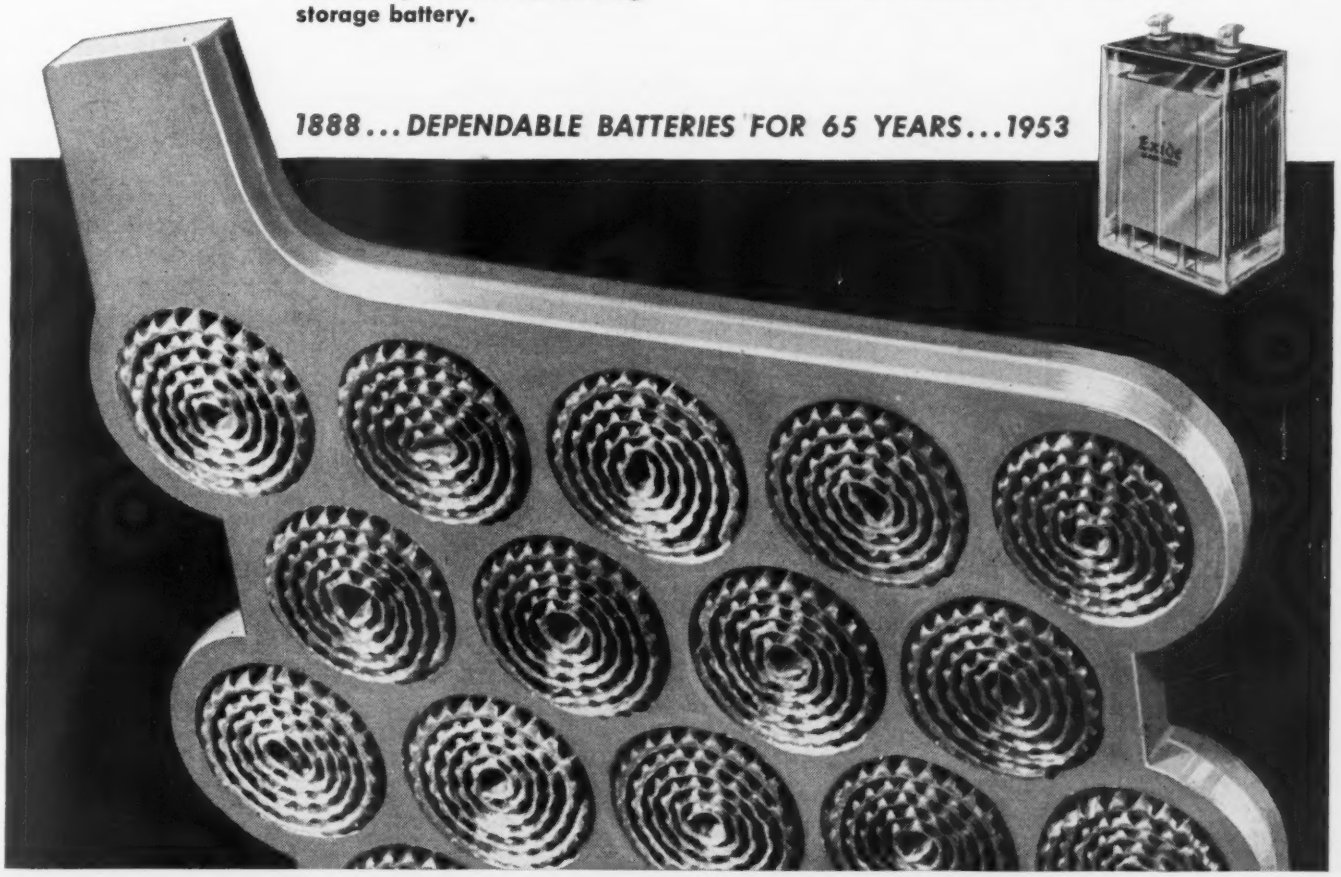

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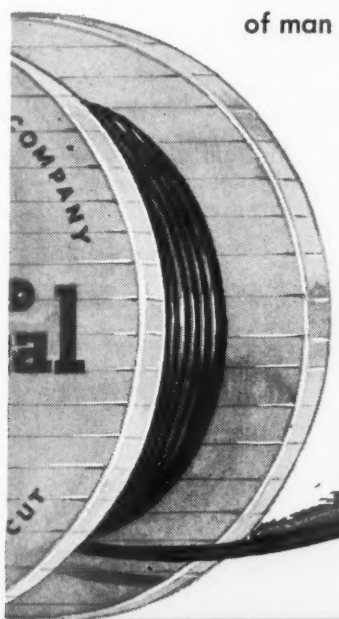

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INSURES STABILITY — Frequency range is 40-150 kc; drift is **less than one cycle.**

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Lenkurt Type 45A Wire Line Carrier Telephone System costs less to buy — less to maintain. Components are miniaturized, standardized, "plug-in" units; complete channel assembly plugs into small space as shown above. You can order equipment to fit your needs *exactly* and add channels one at a time, as your needs increase. Maintenance is simple — takes little time, costs little because any of the "plug-in" components can be quickly and easily replaced. And Type 45A saves more than 80% on floor space; three complete 12-channel systems can be mounted on one standard rack!

Lenkurt's new Type 45A Carrier will "prove in" where carrier could not be used economically before. Even if you have never used carrier, it will pay you to get the facts on Type 45A. Write us today!

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Originators and Developers of the Strowger Step-by-Step "Director" for Register-Sender-Translator Operation . . . Machine Switching Automatic Dial Systems
Makers of Telephone, Signaling and Communication Apparatus . . . Electrical Engineers, Designers and Consultants

Distributors in U. S. and Possessions: Automatic Electric Sales Corporation
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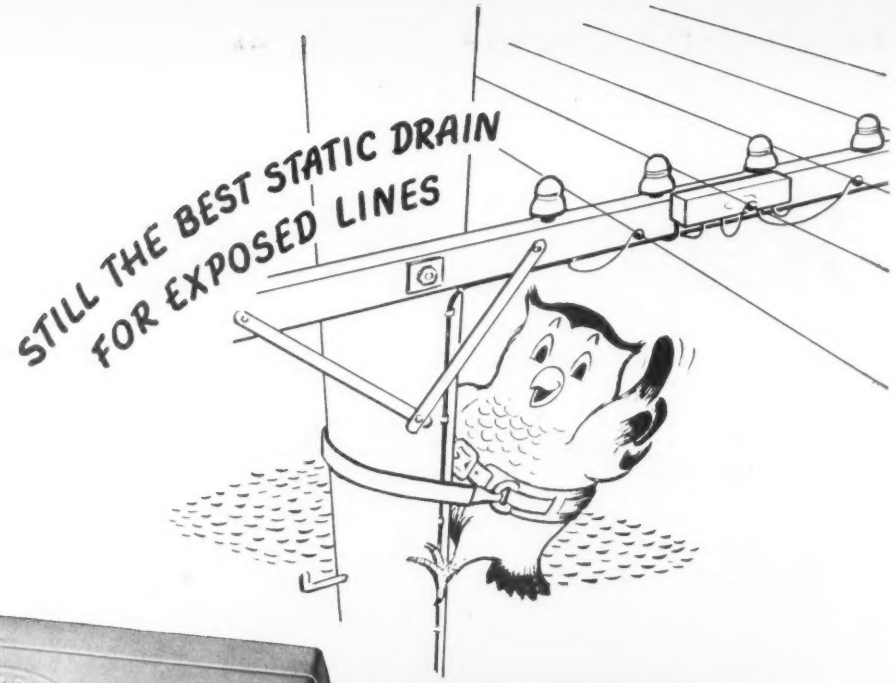

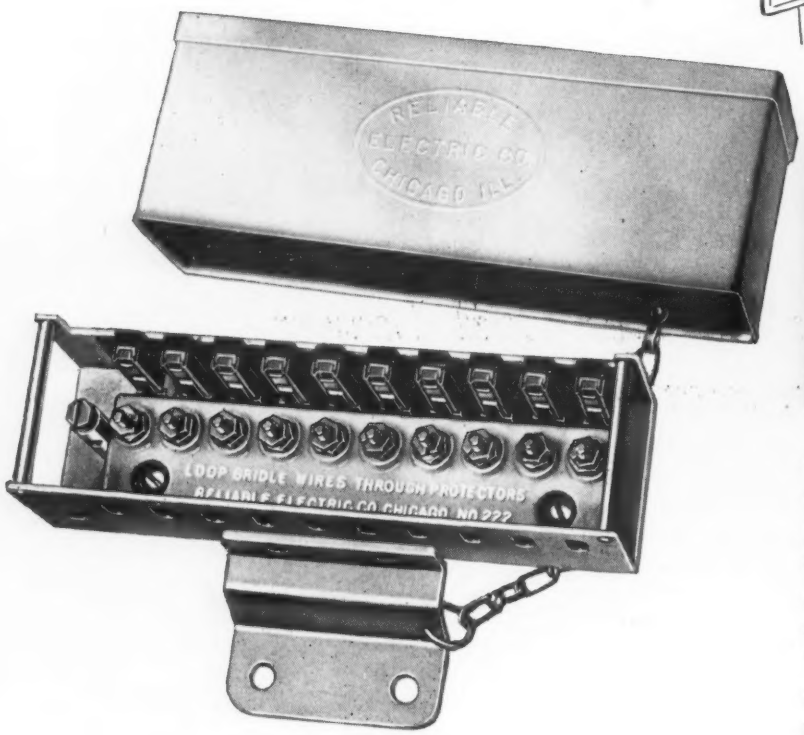

This housing, less discharge units, is also marketed as a Reliable No 10-W Terminal for 5-pair cable.

The "222" Outdoor Arrester

The "222" hardly needs an introduction . . . it has been protecting exposed lines for years in all parts of the country. Its original, basic design is still tops . . . simple, rugged and efficient. The "222" features the "P-495-L" Self-Cleaning Sawtooth Discharge Block for most effective static drain. Installing and servicing this roomy, wide open unit is a pleasure. In short . . . you will find the "222" to be designed right . . . and produced right for longer than average service. Standardize on "222" . . . a Reliable Product.

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Telephone Protective and Terminal Equipment for all Station, Line and Central Office Needs.

OVER 45 YEARS SERVICE TO THE TELEPHONE INDUSTRY

TELEPHONE
ENGINEER & MANAGEMENT
April 1953

Finding Troubles Before They Happen

By G. ROBERT KNELL

Preventive maintenance guards the dependability of the service while holding the expenses of the operation in economic balance.

MOTHER waxing the floor, Dad greasing the car, and young Jimmy visiting the dentist twice a year are all taking part in preventive maintenance programs which are considered important in our way of life. Less familiar, perhaps, is the preventive maintenance provided to insure the continued high quality of service which has become a way of life in the telephone industry.

Cutomers usually measure the quality of their telephone service by its dependability. Twenty years ago, each of them, on the average, notified us once in every 14 months that his telephone would not work or service was unsatisfactory. Today, improvements in both equipment and preventive maintenance measures have increased that interval to once in every 24 months. Telephone folks can look with pride on that accomplishment, and it is safe to predict that in the next twenty years the interval between reports of trouble will be ever greater. However, even with the best efforts in design, construction, and maintenance, completely trouble-free service is impossible — since the elements and outside agencies often damage the plant.

Telephone maintenance work may be divided into two types, corrective and preventive.

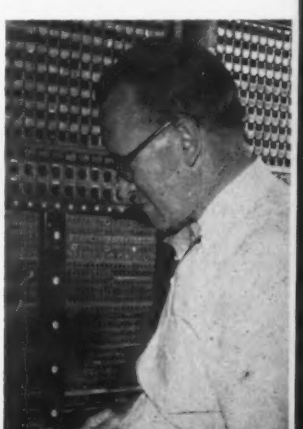
Corrective maintenance is the actual finding and correction of trouble conditions after they have had a recognizable effect on customers' service. They are brought to our attention by customer complaints of trouble or dissatisfaction with their telephone service; by some member of the telephone family who recognized a fault or failure during his daily work; or by a variety of complex trouble alarms, indicators, or recorders.

Preventive maintenance, on the other hand, is anticipating and correcting potential trouble conditions before they can affect the service of our customers. In other words, finding troubles before they happen.

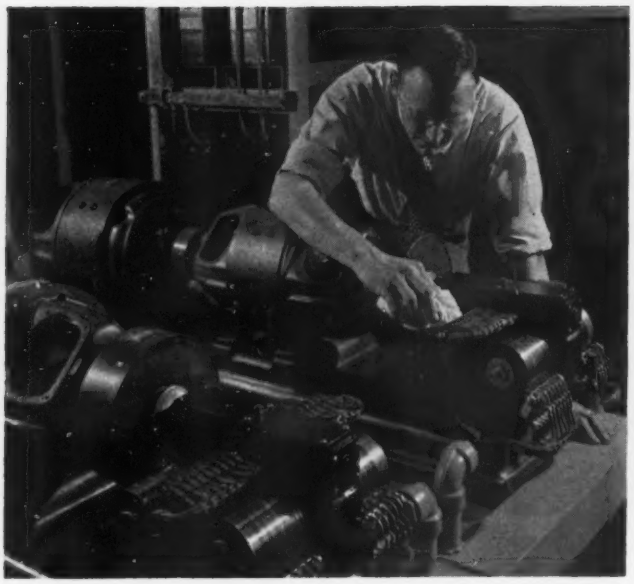
To explain the method by which preventive maintenance measures are developed, let's look back for a moment into the early days of the industry.

Many years ago, Plant people recognized that one of the major sources of interference with good customer service at manual switchboards was traceable to the switchboard cords. Constant handling of the cords by the operators and repeated bending when the plugs were inserted in the jacks caused the fabric covering to fray and then break. Having reached this weakened mechanical state, the wires in the cord would soon break. During the busy hours of the day, these inoperative cords could often seriously hinder the flow of telephone traffic.

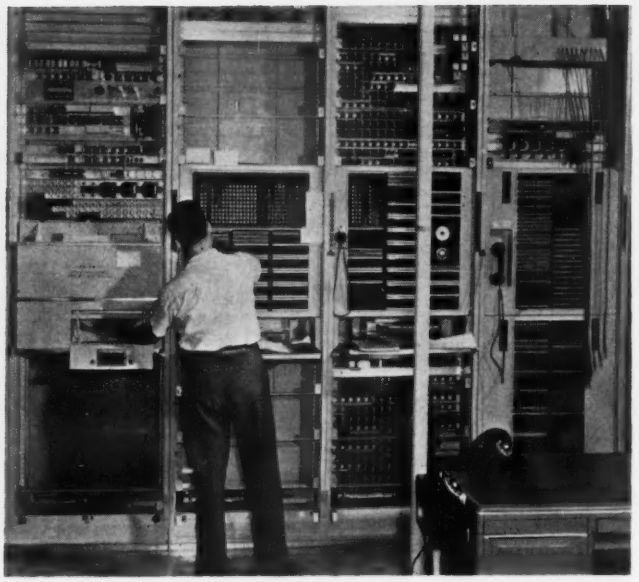
Having detected the trouble and recognized its cause, a preventive maintenance measure was readily apparent. Frequent inspection of the



One of the early forms of preventive maintenance: checking the cords for wear at a manual switchboard.



A regular preventive-maintenance task: cleaning the alternative ringing machine.



Removing a card from the trouble recorder: a more modern way of locating trouble than by laborious hand testing.

switchboard cords, and replacement of those that had become frayed, effectively eliminated that interference with service. But the plant folks of the day, keeping a watchful eye on costs, soon found that too frequent inspections led to an uneconomical performance. Records of the number of times that operators reported failure of a cord in service, as well as the number of frayed cords found on inspection, were used to establish proper and economic intervals between inspections. Because of the recurring nature of such inspections, they became known as "routines" and the interval between inspections as the "routine frequency."

Determining today's requirements for preventive maintenance measures in a nation-wide telephone system is a sizeable job. It becomes more impressive when we consider that this equipment enables any telephone user not only to be connected with the 45 million telephones in the United States but with 96 per cent of the 79,300,000 telephones in the world. Furthermore, 80 per cent of the Bell System's telephones are currently handled by a variety of complex dial central office equipments, and somewhat more than 40 per cent of their toll traffic is handled by mechanized equipment which permits the originating operator to complete calls by dial methods. *Amazing* is not too strong a word.

Preventive maintenance has grown in requirements and methods, progressively, as the telephone system has increased in complexity. No longer are troubles limited to the individual customer's telephone, line wire, and simple manual switchboard equipment; nor is the plant man's "look-see" sort of inspection a completely effective measure. Advances in the art of dial telephony have introduced "common" equipment, so-called because it is used by more than one line in the office. Dial senders, decoders, and markers, often referred to as the mechanical operators, fall into this category. Although used to establish a call, they automatically release upon completion of their function, to become available for other calls. Complicated test equipment, mounted on frames or "test wagons" and in portable test sets, provides means for periodic checking of the operating capabilities of such equipment, to aid in revealing any potential trouble conditions that may exist.

A manual routine testing operation on dial equipment: checking selectors in a step-by-step central office.

Built-In Preventive Maintenance

DURING this era which we might call "the telephone age," an ever-present desire to improve telephone service is apparent.

Let us look now at the development of preventive maintenance methods for dial central office equipment. "Step-by-step," the first tvpe of dial equipment used in the Bell System, had no means for automatically recognizing trouble conditions before they affected customer service. Preventive maintenance effort consisted of inspection, lubrication, and manual testing of the dial equipment under limiting conditions.

When the Panel dial system was developed, in the 'twenties, complex "common control" equipments were used. Engineers, recognizing the inadequacy of manual testing methods for this complicated equipment, devised automatic test frames. They are capable of automatically applying mechanical and electrical tests more severe than the operating conditions encountered in customer service. When a test frame recognizes a trouble condition during a test, it gives an alarm—and a plant man can

fix the trouble before it can affect customer service.

In the 'thirties, additional preventive maintenance aids were built in to the newer No. 1 crossbar dial system. In the older systems, when the equipment encountered a central office trouble while completing a call, the customer was stranded and eventually had to "hang up." Yet when he dialed again, usually the call was satisfactorily completed. In crossbar offices, when a central office equipment failure is encountered, the equipment automatically "recycles" itself, and attempts to complete the call by using different central office equipment. In telephone parlance, we make a second attempt, and generally complete the call for the customer without making him re-dial. In addition, under many failure conditions, a trouble indicator is connected momentarily to the equipment to identify by lighted lamps the equipment associated with the failure. Plant people are then able to analyze successive failures and pinpoint equipments which require maintenance.

In the 'forties, a trouble recorder was provided in the No. 5 crossbar system to replace the trouble indicator. This equipment provides the same feature of identification of equipment involved in a failure, but it accomplishes the recording by punching out a card rather than requiring a central office man to read the lamp indications. Thus a record can be obtained of most troubles for later analysis even though a plant man may not be available at all times.

Pushing the button automatically performs a line installation test.

This manual way of performing a line installation test is being superseded by the automatic method.

Directing Preventive Maintenance Activity

JUST WHERE to apply preventive maintenance is found pretty generally by analyzing the records of corrective maintenance. Looking at a particular case of trouble will perhaps show how it contributes to the records which will eventually reveal the need for preventive work.

Mr. John Customer, unable to use his telephone because he doesn't get "dial tone," calls the telephone repair service bureau from a neighbor's house to report Republic 9-1234 out of order. Susan Bell, the repair service clerk, takes the details of the complaint and enters them on the "daily trouble log" and on the "line card" for Republic 9-1234. The line card then goes to Peter Deskman, who makes a test of the line. From it he concludes that the trouble must be in the central office, and so he passes the necessary details along to Sam Switchman.

Sam finds that Mr. Customer's "no dial tone" was caused by a contact trouble on the line relay associated with Republic 9-1234. After making the necessary adjustment, he advises Pete that the trouble is cleared and makes an entry in the central office trouble records to indicate that a Republic 9 line relay had to be adjusted.

Pete enters on the line card the details of the trouble found, retests the line, and advises Mr. Customer that his line is "OK now."

Susan then closes out the complaint by classifying the Republic 9-1234 entry on her "daily trouble log" as a trouble found in the central office equipment. And she summarizes her logs daily and monthly to indicate how many troubles have occurred in each classification of plant.

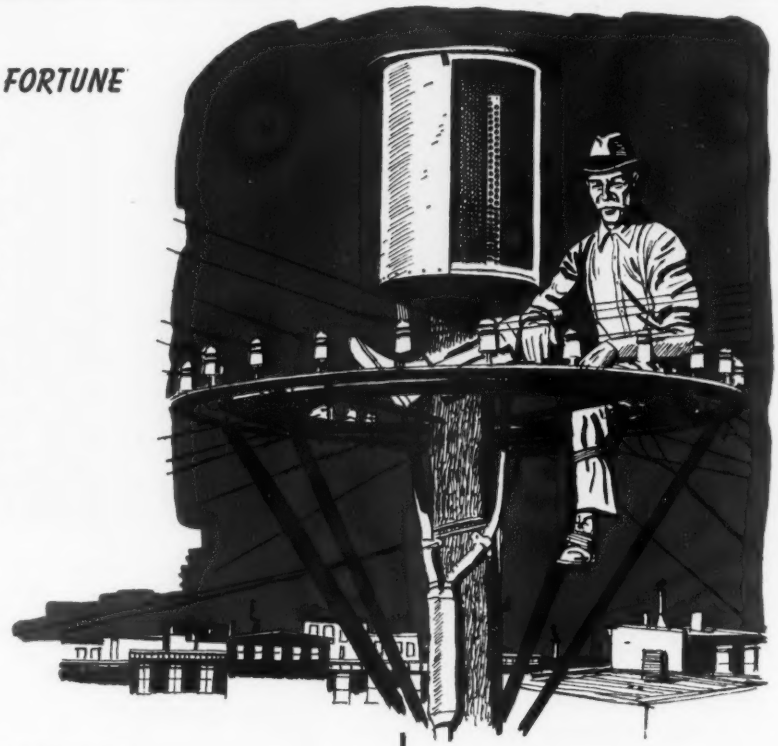
At the end of the month, Pete's and Sam's supervisors get together to review results. From the summary of "daily trouble logs" they find that central office troubles in Republic 9 are increasing, and from the central

GraybaR TELEPHONE NEWS

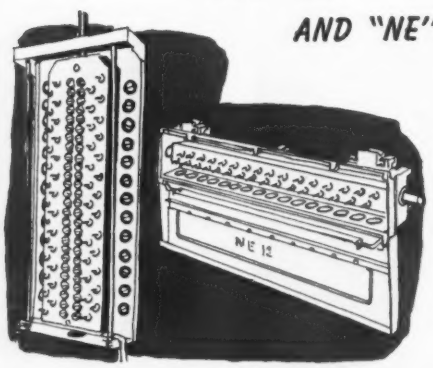
WHEN A LINEMAN'S FIGURE WAS HIS FORTUNE

It's easy to see why telephone companies in the 80's might have kept a wary eye on employee waistlines—only a trim, athletic lineman could squeeze his way through the clutter of spokes, braces, cables, and tangled wire at the top of this typical open wire junction pole.

Crude beginnings to be sure, yet improvization of this type fathered many of the carefully-engineered cables, cable terminals, and accessories distributed by Graybar today. Here are just a few of these specialized items promptly available through our 109 strategically-located offices and warehouses.



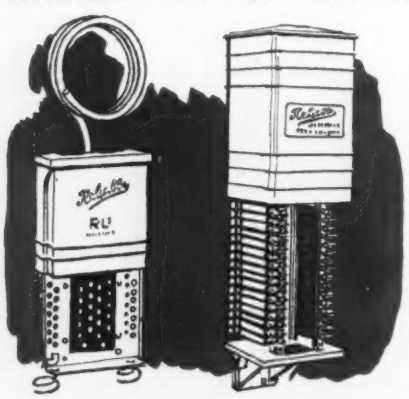
TYPE "NC" AND "NE" CABLE TERMINALS



An unprotected type, the NE terminal consists of a housing of cast aluminum alloy containing removable selectron binding post chamber and 24-gauge paper-insulated cable stub.

Similar in construction the NC unit features a built-in protector block, using the screw-in 107B protector. Both types are available in 10- and 16-pair cable-supported models and in a 26-pair unit for vertical pole or wall mounting.

RELIABLE TYPE "RU" AND "B" POLE-MOUNTED CABLE TERMINALS



A reversible unprotected terminal, the type RU unit can be installed either stub-up or stub-down. The flat fanning plate in combination with a cover surrounding the wires assures a weather-proof installation. 6-, 11-, 16- and 26-pair models.

The protected type B unit is equipped with Reliable's new self-cleaning sawtooth discharge blocks that eliminate carbon problems. Heavy silicon bronze binding posts insure freedom from season cracking. In 11-, 16-, and 26-pair models. 331-233

EVEN A GOPHER GETS INDIGESTION

In addition to protector mountings and protectors of many types, Graybar also distributes a wide variety of standard and special cables—even a type designed to be particularly displeasing to Gophers. Whether you need tape-armored, jute, galvanized-armored, corrosion-protected, or wire-armored submarine, there's a cable to meet the conditions in your locality . . . and Graybar can supply it.

For complete details on any telephone need consult your Graybar Representative.

GRAYBAR ELECTRIC CO., INC.
Executive Offices:
Graybar Building, New York 17, N. Y.
IN OVER 100 PRINCIPAL CITIES

Call Graybar first for...

331-223

office trouble records they discover that the larger part of the trouble involves line relay contacts. They immediately plan a preventive program to inspect and adjust the line relay contacts in the Republic 9 office.

Obviously, the maintenance team of Pete Deskman, Sam Switchman and Joe Repairman does not find the cause for every customer's complaint of trouble. Even so, careful analysis of several such "not-found" troubles may identify equally productive points for the application of preventive maintenance measures.

Determining Requirements

DETERMINING the requirements for preventive maintenance work, as well as providing the methods and determining the interval between applications, are all initial steps in the overall program. Tools and training must be provided for the 125,000 Bell System people who at various times perform maintenance tasks. Both school instruction and day-to-day job training provide basic knowledge but they need to be supplemented by a vast amount of information.

Bell Laboratories engineers provide detail drawings and descriptions of the operation of each new piece of equipment, as well as instructions on maintenance, adjustment, cleaning and lubrication. Bell System Plant and Engineering people in both the A. T. & T. Co. and the various Operating Companies assist in the latter work and prepare practices on the administration of the job and any specialized local situations, and Western Electric Company folks manufacture the test equipment.

With the complexity of the telephone plant that we meet in our daily work, satisfactory customer service requires engineering, laboratory, and manufacturing folks to play on the same team with the repairman.

Watching The Costs

PLANT PEOPLE must keep a watchful eye on costs. Too much preventive maintenance work can force costs to a point of diminishing return which will make the entire operation uneconomical.

We might return momentarily to our original example of Dad and the family car. When it was purchased, the owner's manual recommended 300-mile and 1,000-mile inspections and servicing, followed by a continuing series of greasing, lubrication, and other miscellaneous items, all at stated intervals or mileages. Dad read the advertising at the service station, too—and bought all of the items recommended there. Undoubtedly he was pleased with the car, and it gave the family excellent trouble-free service. Dad, a cautious fellow, had followed instructions — but he sometimes grumbled when the bill came in on the first of the month.

Digging down to telephone wires to free them from their unaccustomed burden of snow is an unusual form of preventive maintenance.

Central office preventive maintenance routines had developed over the years until, in the late 'forties, service furnished by the equipment was good; yet looking at the maintenance bill every month raised the question as to the proper economic balance between maintenance cost and the quality of service obtained.

The situation was reviewed in 1948, and a large-scale study was started to determine what might be the proper relationship. Central office buildings of various types, in all parts of the country, were selected to participate in a long-term trial.

A committee composed of Engineering and Plant men was established in each of these offices to control the trial, protect the quality of customer service, and insure against any progressive deterioration of equipment. Then all preventive maintenance activity (except certain lubrication of power driven machinery) was temporarily suspended. As customers reported their troubles, tabular records were kept; and as indications of need developed, preventive routines were reestablished. In addition, plant people kept a watchful eye on the equipment and, as needs became evident, suitable routines to care for such conditions were also reestablished.

Results of the study indicated that, although some routines had not been performed often enough, many had been performed too often to pay their way. Furthermore, there was strong

(Please turn to page 76)

This patrol plane is dropping a warning message (shown at right center) to a road grader working near a buried cable.

Good housekeeping on work done following right-of-way agreementmakes it easier for other rights-of-way to be granted afterwards.

Getting Right-of-Way The Right Way

by JOHN B. HENKELS, JR.*

Getting right-of-way involves more than obtaining the "silent consent" of the property owner. The owner must understand the need for the right-of-way.

BACK IN 1923 my office was in a corner of my house, Mrs. Henkels was the office force, a second hand truck was our equipment and five men were the crew when our "company" became the first in the Philadelphia area to tackle tree trimming for utilities — and we got our first experience in getting rights-of-way.

**Mr. Henkels is associated with the Henkels & McCoy Construction Co., Philadelphia, Pa.*

By now, of course, just about all this work is done by non-utility men and several firms besides ourselves are hard at it around here. But we have 22 crews now trimming trees year-round and, in addition, our company (Henkels & McCoy) has progressed to a variety of activities many of which require right-of-way negotiations. While we don't claim to know all the answers, we do feel that we've had most of the questions flung at us and have had to discover many of the basic truths about getting the nod from property owners.

"Not A Simple Matter"

IN THE first place, let me point out that we see right-of-way negotiations *not* as simply a matter of getting each owner's acquiesence — which by dictionary definition means just "silent consent." As so much of a telephone company's public relations success hinges on how these negotiations are handled, we aim our efforts at getting *whole-hearted approval* from owners who are made to understand the need for the right-of-way on their land.

To obtain this kind of permission

Day After Day...

Copperweld TRADE MARK LINE WIRE

SPEAKS FOR ITSELF

IN PERMANENTLY BETTER VOICE TRANSMISSION...

Due to its thick, molten-welded copper covering, Copperweld* Line Wire has the best electrical conductance of any high-strength conductor. And Copperweld retains its original voice and high frequency transmission properties permanently, because it is impervious to rust—the enemy of good voice transmission.

IN PERMANENT HIGH STRENGTH...

The copper-protected steel core of Copperweld Line Wire provides the permanent high strength necessary for stringing safer long spans. That means substantial economies in initial construction costs as fewer poles, accessories and man-hours are required. Also, you save on maintenance because Copperweld is rugged—able to withstand severe weather conditions.

IN LONG, ECONOMICAL, RUST-RESISTING LIFE...

When you string Copperweld Line Wire, you can count on a lifetime of trouble-free service at lowest annual cost. That's because this dependable conductor gives the permanence and long life of copper plus the strength of steel. Remember—with Copperweld, you can rest assured that rust will never attack and weaken your lines. Once Copperweld goes up, your operating costs go down—and stay down!

The Copperweld Telephone Data Book should be in your file. If you don't have a copy, write for it today.

*Trade Mark

COPPERWELD STEEL COMPANY

Glassport, Pa.

SALES OFFICES IN PRINCIPAL CITIES

Copperweld Line Wire

STRONG, NON-RUSTING

Costs Less... because it lasts longer!

SOLD BY LEADING DISTRIBUTORS

"Salesmanship is required for the man getting rights-of-way. Like all good salesmen, he should base his selling on pointing out the advantages of buying his product . . ."

— particularly on new line construction where it is harder to come by — the man whose job it is should — (1) be thoroughly prepared, (2) be completely honest, (3) have a good knowledge of trees and shrubs, (4) be tactful yet firm, (5) have the patience needed to stick with slow-going negotiations. This man's assignment is important. Obviously his caliber should be equal to the job he has to do.

Thorough preparation is vital because he must have a complete and ready answer to the first question property owners will ask him: "Why my side?". The overwhelming majority of people will accept a straightforward, logical answer to this question. Conversely, they won't be satisfied with the flat statement, "This is where the utility wants it."

Preparation for this *"why-my-side"* question is called for also, of course, from the utility so that its plans are made with both the utilitarian and the public relations viewpoints in mind. In this connection, I recall an instance where engineers went along a road, driving their stakes precisely every 135 ft. — whether inches away from a drive way or not. Our man looked the situation over and talked with one of the big property owners who told him that he owned much of the undeveloped land on the other side of that road where he would be happy to see the poles go. The upshot was that the line was re-located, the property owners were pleased, fewer trees had to be removed and the linework even went faster and at lower cost. There is no need for the right-of-way negotiator to discard initiative.

"Honesty, The Best Policy"

HONESTY in obtaining right-of-ways is not only the best policy — it pays off better too. I often cite the experience I had with an estate owner who had a fine White Oak that we had to top.

"Will this damage the tree?" he asked me.

"Yes, it will," I said bluntly. "In fact, it will die in four or five years, although you won't notice the symptoms at first."

"OK, go ahead," the man replied, "I know pretty much about trees myself. I was just testing your honesty."

Only complete honesty on the part of the man securing right-of-ways can protect the telephone company from loss of good will. It should be made clear to this man that his success at his job depends not only on the right-of-way he gets but on the repercussions afterwards that he fails to get.

Of course, without sound knowledge of trees and shrubs the statements this man will make can not always be accurate. One of the main reasons we were given tree-trimming contracts originally was that the work was being done by linemen who didn't know trees. Today the need for this kind of training is even more important because of the growing use of Tree Commissions by parks, cities, townships and states. (Connecticut, for example, has a lively commission which requires those doing tree-trimming and right-of-way clearance to pass a stiff examination.)

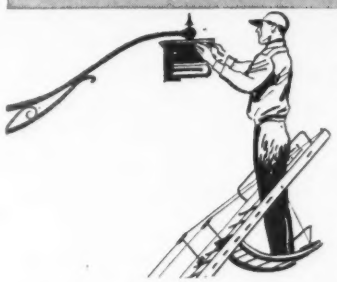
"Good Salesmanship Required"

CLEARLY salesmanship is also needed by the man getting right-of-ways. He must have a winning personality, be confident that his "prospects" will agree with his point of view, be tactful yet firm. He is out to get the order but his selling should not be high-pressure for there should be no angry arguments or cancellations after he has gone. Like all good salesmen, he should base his selling on pointing out the advantages that come from buying his "product."

One of our best examples of how preparedness and shrewd salesmanship can get the job done happened not long ago out on Baltimore Pike where we had to get the right-of-way

Most property owners will respond favorably to a straight-forward, logical approach. Here a Henkels & McCoy man shows the owner of this sick tree why it is a menace.

Lowers Operating Costs



Steps up crew efficiency!

Powers-American bodies do their job faster, more efficiently, and at lower cost, because they're "*job-engineered.*" Each model incorporates design features *proved* by utilities over many years of operation, and is field-tested under actual working conditions by utility engineers *before* production! "*Job Engineered*" means long life and trouble-free service for you, whatever your utility body needs may be. Look to *Powers-American* as *your 1* source for *all* types of utility bodies and equipment.

REVOLVING AERIAL LADDER

Can be extended to any length, spotted in forty positions throughout a full 360° revolution, and inclined at any angle from 30° to 75°. Easily operated by one man. Safe enough to support 4 times normal working load. Available in sizes having ground-to-platform heights from 23' 6" to 32' 3".

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Available in models having ground-to-platform heights of 25', 28', and 30', for installation on chassis having 1½ ton capacity or more.

GENERAL SERVICE BODY

½, ¾, 1, and 1½ ton models. Can be equipped to meet any operating requirement.

FORESTRY BODY

For tree trimming and clearing. Also available with winch and derrick for construction work.

LIGHT CONSTRUCTION BODY (350)

Fold-over derrick can handle poles up to 40' in length. Underfloor winch leaves loading area clear.

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McCABE-POWERS AUTO BODY COMPANY

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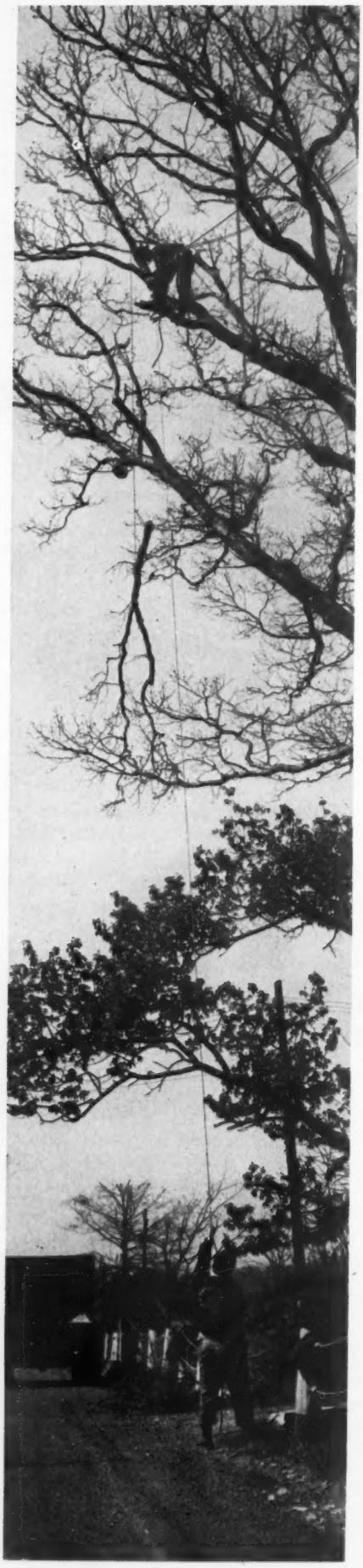
There are many styles of *Powers-American* Bodies not shown here. Write for descriptive catalog today.



The promise to do expert work carefully and only as needed, must be lived up to.

for work that was to excavate one side of Route #1 for several miles.

The first thing our man did was to locate — through discussions with utility personnel, trades people and the like — the "crabs" who would probably be the toughest nuts to crack. He found he could expect trouble from a roadside restaurant owner, a garage operator, a real estate man and an estate caretaker.

He dropped in at the restaurant and, after complimenting the owner on his coffee, asked, "Are you equipped to supply 40 men with lunch every day for a couple of months?"

With visions of his cash register working over-time, this tough-nut was turned into a one-man welcoming committee and right-of-way became no problem there.

In the same manner, the garage man was asked if his gasoline supply was sufficient to keep a fleet of trucks going. The real estate man turned out to have a barn where our trucks and equipment could be stored over weekends at reasonable cost to us — and with nothing extra for his right-of-way okay. The caretaker, for a fair fee, agreed to take care of our lights and check our barricades at night and over weekends. With this group solidly behind us, all right-of-way approval came swiftly and agreeably.

Our payments in this case to the real estate man and the caretaker were for services rendered and in no way violated our basic rule: *pay no money.* Money settlements snowball. Pay out cash once and the word spreads so that everybody has a hand out.

Nor, when getting right-of-way approval, do we ask for signatures on any sort of agreement. People balk at signing almost anything. It's far better to base the procedure on the honor system. That works just about all the time. When tricky situations loom up, a witness can go along to make the "yes" more binding.

By and large, people respect the point that their approval will help others in times of illness and other emergencies. But there are, of course, times when standard procedures are not enough. (We've found that the greatest single reason for "hold-outs", by the way, is that they are disgruntled at having their service cut off due to their failure to pay their bills!) To help swing okays on the tough cases we have replaced and re-planted shrubs. We've trimmed in other parts of the property for free. We try to clean out deadwood and shape wherever we can. When a tree has to come down, we've eased the pain by cutting it up into logs the right size for the owner's fireplace. We have supplied awnings and once we took a hard-to-persuade oldster with an aching back to the hospital for x-rays that helped him become a firm friend of ours. Absentee ownership involves extra leg work; unknown ownership turns us into detectives.

Sometimes, when trouble seems likely, we send out more than one man—one type of person can be expected to do better with estate owners; another can be more persuasive with farmers, service station operators and tavern keepers.

Our most complicated right-of-way assignment was dropped in our laps in a town near Philadelphia where the utility had been sold and the new organization saw the pressing need for much tree trimming. Led by the local newspaper, the whole town was against this "onslaught on the town's beauty." Before talking to a single property owner, we went over the story with the paper's editor and we talked at women's clubs and community gatherings. Resistance, following the full and logical presentation of the facts, melted and what could have been a knock-down, drag out fight was avoided.

Our most satisfying right-of-way assignment came when we were requested to close the deals for purchase of some eighty properties to make way for the New Jersey Turnpike. They ranged in size from single lots to entire farms and they had been appraised by outside experts. Using the approach which through the years has worked so well for us, our men settled all without condemnation and the legal formalities followed our agreements without a hitch.

Obtaining rights-of-way, when needed, is a must for a telephone company. Of equal importance is the need to get them with a minimum of dispute, a maximum of good will. Accomplishing this calls for top-level persistance patience and performance —surely not too high a price to pay.

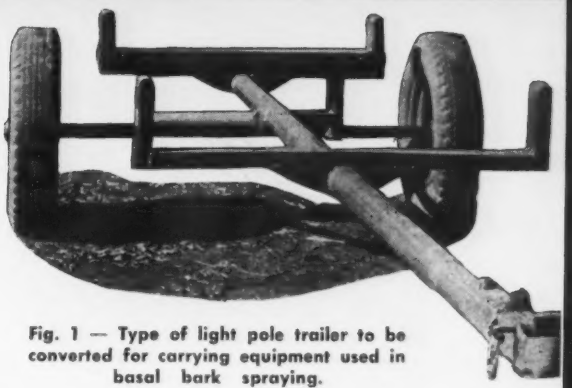


Fig. 1 — Type of light pole trailer to be converted for carrying equipment used in basal bark spraying.

New Construction Methods

By JOHN S. REED

Many factors, including new methods and new ideas, combine to stimulate the continued growth and development of the "world's best telephone service."

Brush Sprayer Equipment Carried on Light Pole Trailer

ORDINARILY spraying equipment and tanks for basal bark spraying of roadside brush are carried in the combination man's truck or in a pick up body type truck. This is not a wholly satisfactory arrangement, because of the slopping over of the spray liquid which damages other equipment carried on the truck and generally creates a messy condition.

It is now a growing practice to transport the sprayer and tanks on a trailer behind the truck. A light pole trailer can be employed for this purpose. In the type of trailer illustrated in *Figure* 1, two old 10 ft. crossarms can be slung under the pole saddles as shown in *Figures* 2 and 3 for supporting the sprayer pump, hose reel, and the oil drums used for the sprayer tanks. With the crossarms mounted as shown, they will not interfere with the use of the trailer for transporting poles, and they may be bolted directly to the pole saddles of the trailer.

The drums are secured to the supporting stringers by the simple hold-down arrangement illustrated in *Figure* 4. The parts for the drum hold downs can be obtained from the company storeroom.

Compact 100-gallon sprayers can be carried in a similar manner if the horizontal tank is mounted to straddle the rear pole saddle and rubber mounts are used to reduce vibration. (Road vibration has been a serious problem in that the tank is crystallized at the mounting points, causing failure of the equipment.)

Guy Strand Dispenser Increases Safety In Handling Strand

THE HANDLING of stiff guy strand has always been a problem to plant instruction and maintenance crews. A coil of strand tends to spring apart when it is untied to cut a piece to use in making up a pole guy. It is difficult to reform a coil that has come apart in this process.

Various methods have been devised to make the handling of guy strand less hazaradous, such as storing the strand in old automobile tires and the like. The guy strand dispenser illustrated in *Figure* 5 represents the latest improvement in guy strand holders. It was produced from plans of Ted Goddard, a veteran line superintendent, now a contractor operating the Midland Construction Co., Los Angeles.

Not only does the dispenser feed the guy strand smoothly, but it eliminates the whipping of the strand end. This is accomplished by the square opening through which the guy strand feeds. The square hole also prevents uncoiling of the strand.

It is a simple process to load the coil of strand into the dispenser as shown in *Figures* 6 and 7. After removing the wing nut, the top can be spread to insert the coil. With the coil in place, the wing nut is replaced and the binding wires are cut from the coil. The strand is pulled out from the center of the coil. The entire guy strand dispenser assembly weighs only 21 pounds, without the coil, and can be carried by one workman.

The dispenser can be hung on the side of a truck during use. The wire

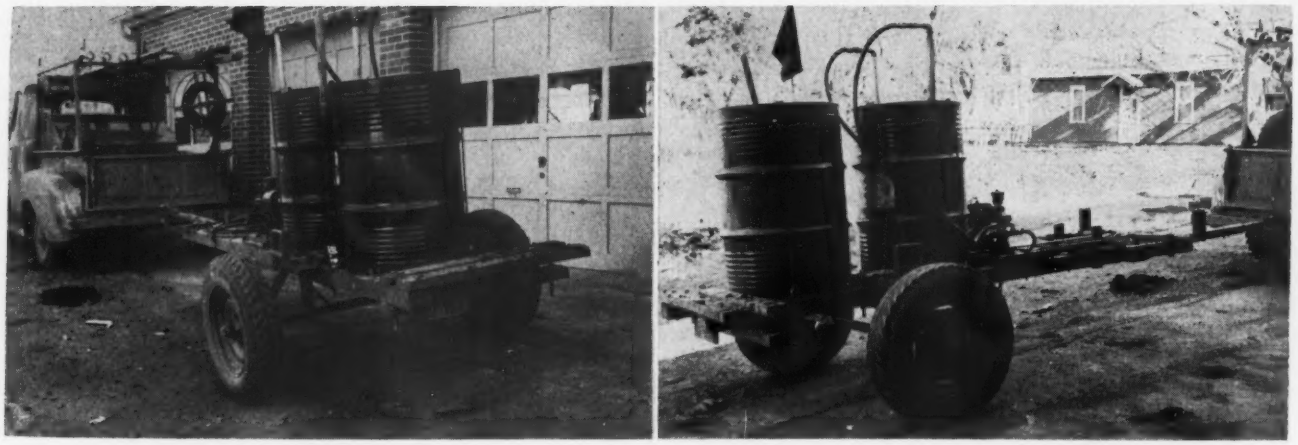


Fig. 2 — Views of pole trailer with oil drums and sprayer. Note small platform at rear for workman to stand on while refilling drums.

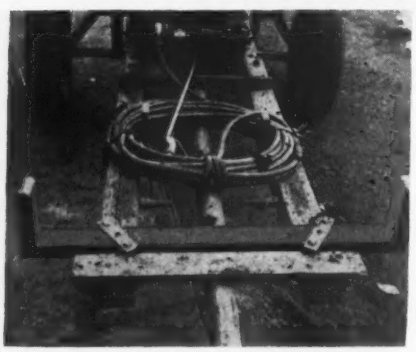


Fig. 3 — Showing how crossarms are attached to the underside of the pole saddles for stringers. Guy clamps are shown used for securing the stringers to the saddles; however, the stringers can be bolted directly to the saddles. Instead of the wood pieces nailed to the stringers for coiling the sprayer hose thereon, an old automobile wheel can be used as hose reel.

Fig. 4 — The drums are secured to the supporting stringers by the simple hold-down arrangement shown above.

is unreeled from either a horizontal or vertical position. After use, the assembly can be placed back in the truck to prevent bending of the unused guy strand.

New Cross-Plate Anchor Fine For Heavy Guying

HEAVY GUYING is not as extensively employed in the telephone field as it is in the power field but there are occasions when very strong anchors are needed as in guying telephone poles at a long river crossing, and at certain railroad crossings.

Plate anchors have long been successfully used for heavy guying. The ordinary plate type is used where an angle hole can be bored for inserting the plate. The angle hole is most economically bored by a machine digger equipped for making either vertical or angle hole. However, some types of diggers can only bore vertical holes. The cross-plate anchor illustrated in *Figure* 8 was designed specifically for machine bored holes, whether vertical or at an angle.

The cross plate anchor measures 24 inches across. It can be installed by one of the two methods shown in *Figure* 9. It has better holding power than log anchors.

Comparative tests have established the fact that in a short time the plate type anchor outpulls a log dead man because of moisture penetration into the tamped pit and the tendency of the log to creep up or "give" under the strain. Tests, made to compare the creosoted log with the cross-plate anchor, show that some of that loss of holding power may be due to the inherent qualities of wood. In laboratory tests on a 100,000-pound testing machine, shown in *Figure* 10, the maximum load obtainable on the creosoted log was 20,000 pounds, and this sustained load caused the washer to pull through and split the log.

The 24″ cross-plate anchor held 70,000 pounds, by the same test, with only slight distortion (*Figure* 11). This load could be sustained indefinitely, whereas the log could only sustain a 16,000 pound pull without

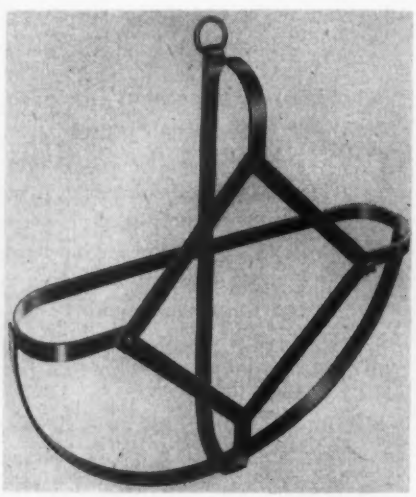


Fig. 5 — Chance Guy Strand Dispenser.

Fig. 6 — Guy strand is loaded and dispensed easily with the guy strand dispenser.

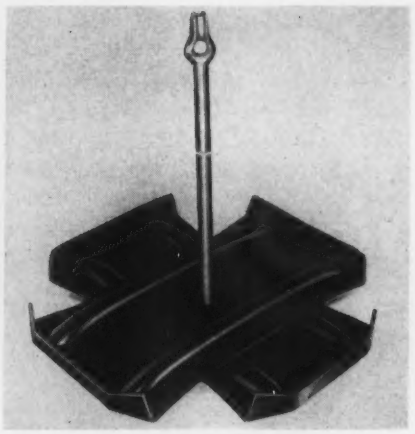


Fig. 7 (left) — The dispenser is shown hung on the side of the truck for removing a length of strand from the coil. The guy strand feeds smoothly without whipping of the end and damage to the unused portion of the coil. The remaining wire can be stored in the dispenser. . . . Fig 8 (right) — Chance Cross-Plate Onchor

yielding. Note that the length of the log would make no difference since the washer pulls through, slacking the guy and opening the log to deterioration.

While a log anchor costs less than a comparable metal plate anchor from a material viewpoint, it takes much longer to bury a log dead man and, with present high labor costs, a metal plate anchor is less expensive to install.

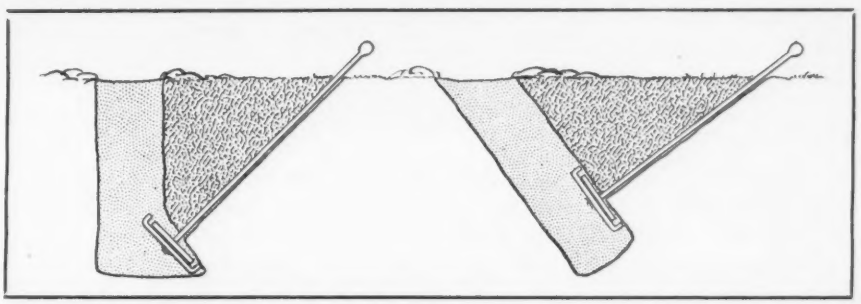


Fig. 9 — These sketches show two methods of installing the Cross Plate in machine bored holes. Left — the vertical hole is under cut and a trench is dug for the rod. Right — a diagonal hole and rod trench puts more of the load against undisturbed earth.

New Type Discharge Block Has Bimetallic Strip

THE COMMON fault of carbon block dischargers is the "dusting" effect from repeated discharges that eventually causes blocks to short out. A small amount of carbon dust is often enough to cause the line to become noisy, without appreciably impairing transmission of voice currents. This requires sending a man out to clean or replace the blocks and restore normal service. Carbon block trouble of this kind results in unnecessary maintenance costs which can be avoided by using properly designed discharge blocks.

The Type 70 discharge block illustrated in *Figure* 12 is designed to ground the line on heavy discharges. Light static charges jump across the air gap without operating the grounding device, but when the current through the gap exceeds ½ ampere, as in power crosses or heavy lighting discharges, the bimetallic strip bends with the heat and makes contact with the carbon block associated with it. This grounds the line solidly until the excessive current flow

Fig. 10 — The testing machine at left was used to make the comparative tests shown here. The washer on the creosoted log anchor started pulling through the wood at 16,000 pounds. At 20,000 pounds the washer had pulled into the log about 2 inches and the log split.

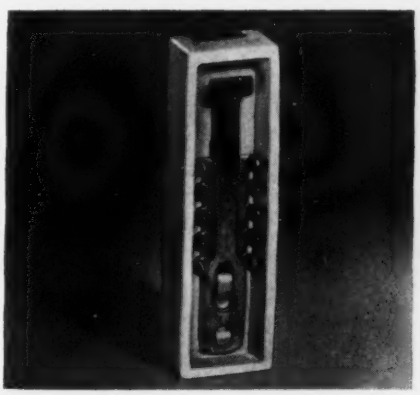


Fig. 12 — Automatic Electric Company Type 70 Discharge Block.

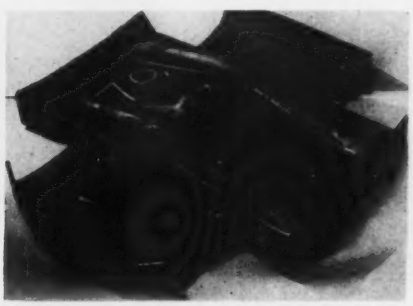


Fig. 11 — The Cross Plate Anchor tested on the same machine pulled to 70,000 pounds with only the slight deflection shown here.

ceases, when the bimetallic strip cools and straightens, restoring service. This sequence of operation is illustrated in *Figure* 13.

This type of block provides positive protection at all times, as the metal does not gradually burn away. In tests with 11,000 volts the discharge block withstood five successive discharges and still was capable of giving additional protection.

The Type 70 discharge block is available in two sizes, with 0.003 inch air gap for station protectors and distributing frames, and with 0.0055 inch air gap for pole mounted protectors. They are made to fit protectors and terminals using 3/8″ x 1¼″ carbon blocks.

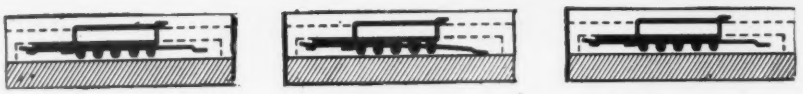


Fig. 13 — Sequence of operations of Type 70 discharge block. Left — Before heavy current discharge. Center — On current discharges between the sawteeth and the carbon block exceeding ½ ampere, the bimetallic strip bends with the heat making contact with the carbon block, shorting out the arc and grounding the line. Right — When the excessive current ceases, the bimetallic strip cools and straightens, clearing the block and restoring the line to service.

New Ground Rod Driver

THE NEW TYPE of ground rod driver illustrated in *Figure* 14 is now available to facilitate the installation of ground rods, particularly the long heavy rods needed in junction protection, buffer protection, and central office installations.

The tool features a heavy chuck which grips the rod close to the ground. A long hollow handle is moved up and down by the operator. Each downward blow strikes the chuck housing and forces the rod farther into the earth. The chuck is automatically moved up on the rod as it is driven. Any length rod can be used as it is fed through the hollow handle from the top.

The workman remains in a natural standing position. He is not required to kneel or bend over as the end of the rod reaches ground level. Weight of the tool provides most of the driving force; hammering strokes are easy guided motions of the arms and shoulders.

The top of the rod is not peened over as with a sledge or other type of driver, and it is easy to install any type of ground rod fitting after the rod is driven.

Where soil conditions require the use of a sledge hammer to drive ground rods, this tool will eliminate this dangerous and awkward method. One man can do the job required by two men. The workmen do not have to start the rod from a pole or from a dangerous position on a ladder, and it prevents accidents caused by missed sledge blows.

The same tool can be used to salvage rods. In this case, the chuck housing is unscrewed, reversed, and the bottom end is screwed on the pipe section of the driver. The tool is then inserted over the end of the rod and jerked upward. The upward strokes are repeated until the rod is out of the ground.

Proper sizes of chucks are available for sizes of ground rod from 3/8 inch to ¾ inch.

Fig. 14—Illustrating ease of driving ground rod with Kearney ground rod driver.

New Finger Grip Guy Clips Easy To Apply

THE USUAL practice in serving guy strand ends is to wrap the tail to the body of the guy with a length of 109 galvanized iron wire or a piece of wire from waste strand. Time can be saved on this operation by using the new "Finger Grip" guy clip illustrated in *Figure* 15. The method of assembling the clip is also illustrated. The grip is so constructed that it is impossible to position it incorrectly and the grip can be quickly wrapped on the strand and tail. Being made of aluminum it will outlast the strand. Two sizes are available, the smaller taking ¼″ and 5/16″, and the larger, 3/8″ and 7/16″ guy strand.

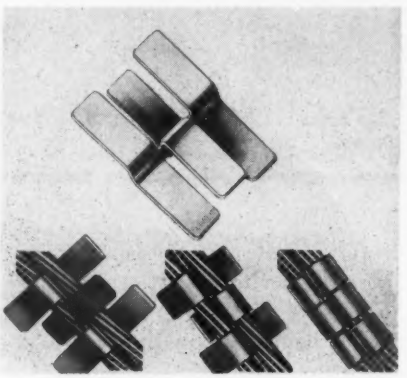


Fig. 15—Above—Kearney Finger Grip Guy Clip. Below—Method of attaching: Left—Insert clip between strand and tail so that tabs protrude over and under as shown. Center—Using fingers, bend preformed tabs around strand and tail. Right—Use pliers to firmly crimp tabs in position.

A.S.A. Provisions For Installing Telephones In Desks

THE AMERICAN Standards Association has established standard provisions for installing telephone equipment on office desks. They consist of general specifications for wiring channels, mounting details for equipment, such as connecting blocks and bell boxes, and inconspicuous entrance holes for incoming wire or cable and for the telephone cord terminating in the telephone set. Facilities to accommodate concealed wiring can be readily incorporated during the manufacture of commercial desks at little additional expense.

Use of the standard should assure both that cables and wires will not be exposed on the desk, and that the desk will not be marred by screw holes upon removal of the wiring and apparatus. Desk manufacturers are already providing arrangements for concealment, but adoption of the standard by the industry will bring about uniform installations.

The standard was developed by the cooperative effort of a committee

(Please turn to page 46)

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representing the desk manufacturers, the telephone industry and desk users. Sponsor of the project is the National Office Management Association.

Although the standard is intended for use by desk manufacturers, telephone companies will find the standard provisions useful to their installers. Illustrations (*Figure* 16) are given for wood and steel desks to show how the inside wires are run and the connecting blocks placed for the telephone instrument.

Concealment arrangements suggested by the standard and shown in the drawings will be found adequate for 90 percent of desk installations.

Copies of the American Standard Provisions of Installation of Telephone Equipment in Desks (X2.1.2-1952) are available from the *American Standard Association, 70 East 45th St., New York 17, N. Y.*, at 25 cents per copy.

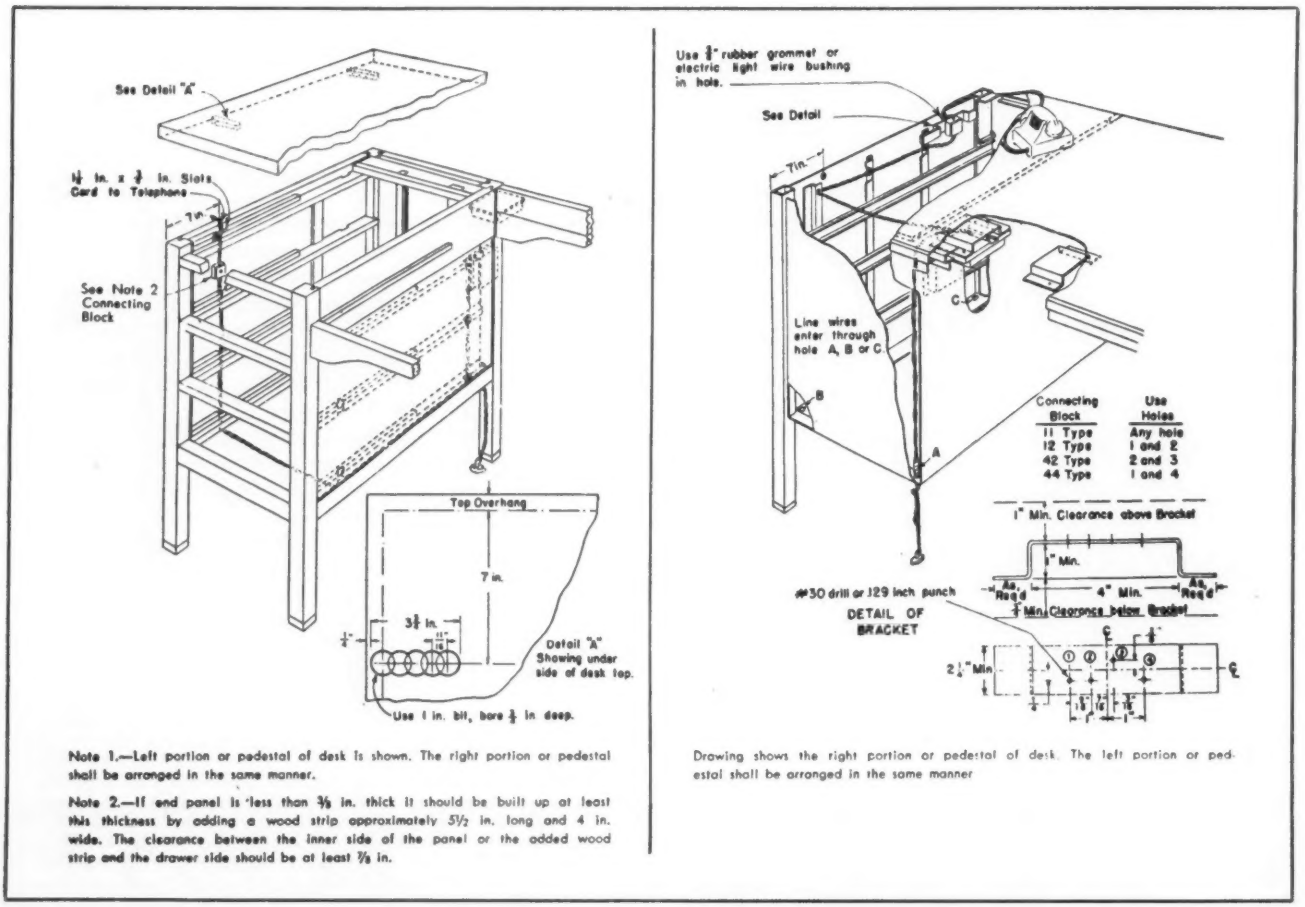
Fig. 17—Deominiac pure water filter for filling small storage cells.

Pure Water Filter For Small Storage Battery Plants

CHEMICALLY pure, soft water is produced almost instantaneously from tap water with a new squeezable bottle-filter made of flexible Bakelite polyethylene plastic. Resilient and lightweight, the plastic bottle is tough and resistant to shocks and can be dropped without breaking. Tap water poured into the 6, 8, or 16-ounce squeezable bottle, passes through the filter fitted snugly in the bottle neck, and emerges purified at the rate of six ounces per minute. Ion exchange chemicals in the filter remove minerals and salts of calcium, sodium, iron, magnesium and sulphate, chloride, bicarbonate and silicate ions. The 2-ounce filter produces 10 to 20 gallons of pure water; the 3-ounce filter, 15 to 25 gallons; the 4-ounce, 20 to 30 gallons. The plastic container is translucent, facilitating ready checks on both the water supply and the filter, which changes color when exhausted and may then be replaced with another.

For small storage battery plants where battery charging is so well regulated that very little water is required for maintaining the electrolyte level in the cells this pure water filter should prove quite satisfactory. *Figure* 17 illustrated how the bottle-filter is used.

—To be continued in the May issue of FORTNIGHTLY TELEPHONE ENGINEER. In the May instllment Mr. Reed will discuss many new ideas that are aiding the industry's growth.



Note 1.—Left portion or pedestal of desk is shown. The right portion or pedestal shall be arranged in the same manner.

Note 2.—If end panel is less than ⅜ in. thick it should be built up at least this thickness by adding a wood strip approximately 5½ in. long and 4 in. wide. The clearance between the inner side of the panel or the added wood strip and the drawer side should be at least ⅜ in.

Drawing shows the right portion or pedestal of desk. The left portion or pedestal shall be arranged in the same manner

Fig. 16—Telephone wiring arrangemets for office desks. Left—in wood desks. Right—in metal desks.

Modern Circuit Testing Methods

By RICHARD ALLEN

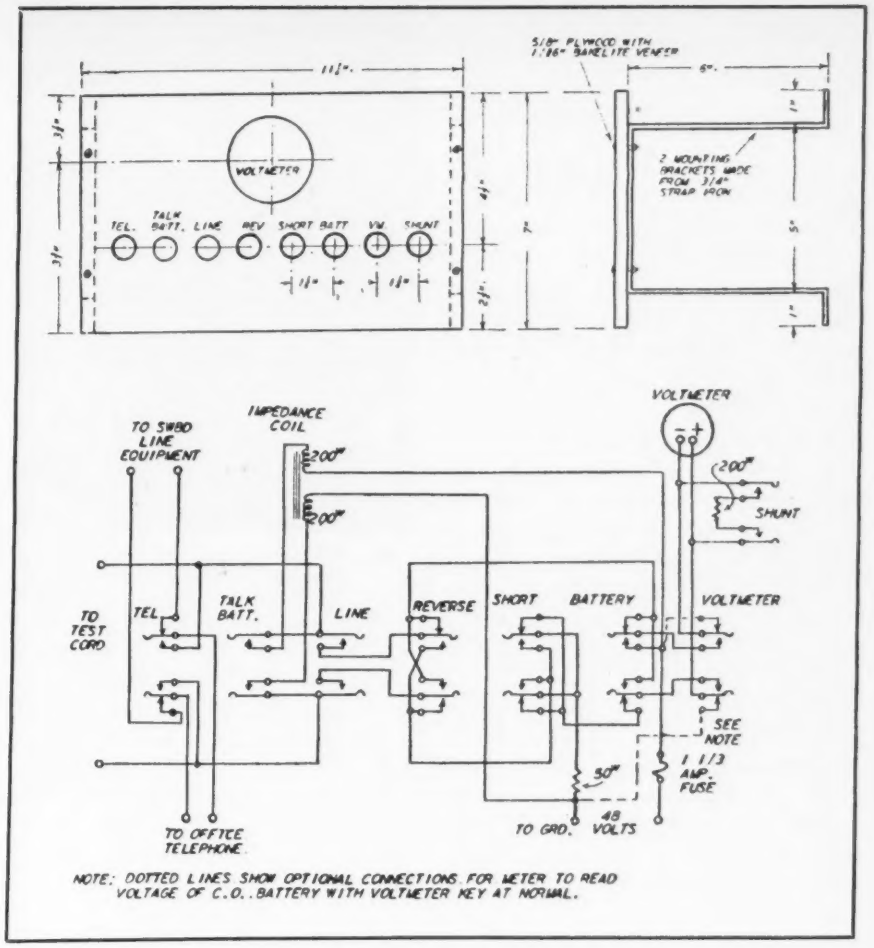


Fig. 1—Constructional details and circuit schematic of line test panel.

In this article Mr. Allen describes practical test procedure based on the experience of a telephone company with the wire chief's voltmeter or line test panel volt-ohmmeter, and magneto test set with inductive fault finder.

AN EXPERIENCED plant man can locate practically any kind of circuit fault with a simple receiver and battery test set if he is allowed enough time to do the job. Such a procedure, however, is very expensive from the viewpoint of labor charges and is hardly to be recommended when various types of good, reliable test equipment are available.

It is not sufficient to merely provide a man with good test equipment and expect him to go out and clear difficult cases of trouble in a matter of minutes. He must be able to understand the basic principles of the instruments and to use the apparatus in an intelligent and systematic manner. The proper instructions and training will give him the necessary information and develop his confidence in the equipment and the methods he employs. As his knowledge and skill improves, he will clear trouble cases with greater accuracy and speed.

It is the purpose of the article to describe practical test procedures based on the experience of a telephone company with the wire chiefs voltmeter or line test panel, volt-ohmmeter, and magneto test set with inductive fault finder.

Tests With Voltmeter Or Line Test Panel

ONE OF THE earliest forms of test sets designed to give a visual indication of the nature of line trouble is the wire chief's voltmeter. The basic elements of this test unit are voltmeter, battery, switching keys, and test leads. The keys are arranged to connect the voltmeter to test circuits for the presence of a short, an open, a ground, or a foreign potential. In addition keys are provided for connecting a telephone for transmission tests and to introduce ringing current into the line for signaling tests.

The wire chief's voltmeter is designed for testing on magneto and common battery lines. It makes use of a local testing battery consisting of dry cells or radio type "B" batteries. The voltage is generally 30 volts for magneto offices or 150 volts for common battery and large dial offices (test desk).

For smaller dial offices, particularly the unattended type, it has been found more satisfactory to use the central office battery for the testing voltage source. The apparatus in this case is designated as a line test panel and is made simple enough to be operated by an exchange man. It should be noted at this point that, unless he is qualified by training to work on switching equipment, the exchange man should make only tests out on the line. He should not be permitted to test inward to the office.

Since line test panels are coming into greater use with the increase in

the number of unattended dial offices, this test equipment is described in the article.

Figure 1 illustrates a typical line test panel used in unattended automatic offices. For exchanges not equipped with this type of test instrument, a test panel can be easily constructed as illustrated in *Figure* 2. Practically any good, reliable type of moving coil meter with 100-volt scale can be used. Lever or push type keys may be used. A standard handset telephone is used in conjunction with the line test panel for transmission and ringing tests. The key positions for testing and for using the office telephone are explained in *Table* 1. Note that the line test panel described in *Figure* 1 makes no provision for foreign battery tests, as in the case of the test panel illustrated in *Figure* 2.

Where the test unit has provision for splitting the line for tests inward or outward the office, a four conductor cord with test shoe is used to connect the test panel through the line protector on the main frame. As a rule, however, the exchange man

Fig. 2—Type of test unit used in unattended automatic offices.

prefers a simple two-conductor cord with test clips. This requires removing the heat coils from the protector or unsoldering the jumpers from the terminal strips (where removing the coils would ground the line). It is very seldom that a test need be made into the office. Practically all the trouble cases occur in the line or subscribers station.

The following line faults can be detected with the line test panel when tests are made on dial lines and trunk circuits:

Opens
Shorts (high or low resistance)
Crosses
Grounds (high or low resistance)
Foreign potential or battery
Leakage (due to poor insulation)
Loose connections (cause of noise or cut outs).

An *open* is indicated by no reading on the voltmeter when the proper keys are operated. In this case, the meter fails to deflect or gives only a slight kick on operation of the reversing or the battery key.

A *Short circuit* is indicated by a resistance reading lower than normal on connecting the meter in series with battery across the line. If the reading is quite low, the shunt key may be operated for a more definite reading.

A *cross* is detected by connecting the test cord to the respective sides of the two lines thought to be in contact. An actual cross would be indicated by a steady reading on the meter. If the wrong sides of the two

TABLE I—KEY POSITION FOR TESTING AND USING OFFICE TELEPHONE

Line Test Panel

*TEST	KEYS OPERATED (Pull out keys—Leave other keys in)	REMARKS
1. Exchange voltage	LINE - SHORT - BATT - VM	Short test leads, Read voltmeter.
2. Battery across line	(No provision made for this test)	
3. Battery on ring (—) side of line	LINE - VM	Use test cord. Read voltmeter
4. Battery on tip (+) side of line	LINE - REV - VM	Use test cord. Read voltmeter.
5. Line capacitance	LINE - SHORT - BATT - VM	Use test cord. Work REV key in and out. Read voltmeter.
6. Capacitance, ring (—) side of line to ground	LINE - VM	Use test cord. Work BATT. key out and in. Read Voltmeter.
7. Capacitance, tip (+) side of line to ground	LINE - REV - VM	Use test cord. Work BATT. key out and in.
8. Ground on ring (—) side of line	LINE - BATT - VM	Use test cord. Read voltmeter.
9. Ground on tip (+)	LINE - REV - BATT - VM	Use test cord. Read voltmeter.
10. Short across line	LINE - SHORT - BATT - VM	Use test cord. Read voltmeter. If this test is made before ground test, and meter deflects, make test for ground on ring (—) line. No deflection would then show line is short circuited.
11. **Loop resistance measurement (high resistance)	LINE - SHORT - BATT - VM	Use test cord. Read voltmeter and use table for resistance reading
12. ***Resistance to ground on ring (—) side of Line (high resistance)	LINE - BATT - VM	Use test cord. Read voltmeter and use table for resistance reading.
13. ***Resistance to ground on tip (+) side of line (high resistance)	LINE - REV - BATT - VM	Use test cord. Read voltmeter and use table for resistance reading
14. Monitor on line	(No provision made for this test	
15. Talk on line	TEL - TALK - BATT	Use test cord and talk on office telephone. With heat coils IN (or jumpers reconnected) at MDF and test cord connected, dial reverting call numbers from office telephone.
16. Test bell rings	TEL	With heat coils IN (or jumpers reconnected at MDF and test cord connected, dial proper number from office telephone.
17. Call out on line	TEL	

* In tests #1 to #15, open line by removing heat coils or unsoldering jumpers as required and connect test cord to terminals or cable terminal strip. To connect test panel to switchboard line equipment, connect test cord to terminal on office side of MDF protector and open the line.
** For low resistance LOOP reading, operate SHUNT key. Use table and subtract 50 ohms from resistance reading.
*** For low resistance GROUND reading, operate SHUNT key and use Table for resistance reading.

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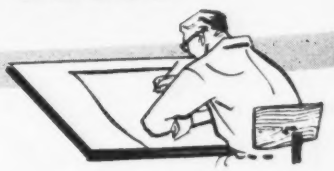

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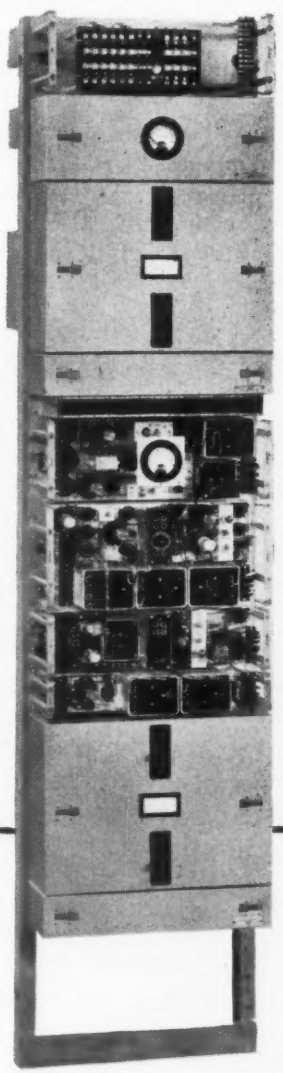

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lines were connected and the other two sides happened to be in contact, a kick of the meter needle may result on operating the reversing or battery key. No reading on connecting between corresponding sides of the two lines would indicate that these lines are not crossed.

A *ground* is shown if the meter reads on connecting it in series with battery between ground and one side or the other of the line. A low resistance reading would indicate a direct ground on the line.

A *cross* with a foreign potential, such as that due to telegraph or railroad signal lines in contact with a telephone line, or to office battery on the negative side of the line flowing through a cross with the line under test, is indicated by a reading on connecting the meter across the line or between ground and one side or the other of the line. In the case of a direct or inductive contact with an a-c power line or introduction of ringing current into the meter, the meter would not read properly and there is danger of demagnetizing the permanent magnet in the meter. Care should, therefore, be taken not to connect the meter directly to the line if it is known or suspected that an a-c potential is present on the line.

Line leakage is indicated by a high-resistance reading. Contact of line wires with trees or shrubs, dirty station protector blocks, a wire off an insulator and resting on a wet or creosoted pole are causes of this trouble.

Loose connections are indicated by erratic operation of the meter if the line is strapped beyond the location of the fault, or a station instrument is connected to the line by the subscriber.

Effect of Line Capacitance On Voltmeter Readings

WHEN TESTING with voltmeter and battery, the voltmeter needle will deflect momentarily on the meter being connected to, or disconnected from the line. This meter throw or kick is due to line capacitance composed of the capacitance of the exchange cable and of the condensers in series with the subset ringers connected across the line.

In the case of a short exchange cable, the cable capacitance is negligible and the meter deflection is almost entirely due to the subset condensers. In this case, failure of the meter to show the normal amount of deflection on testing a line through the short cable may indicate an open between the first station and the office.

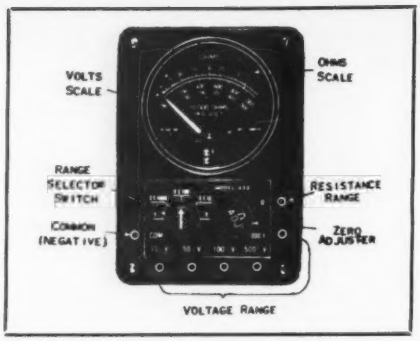

Fig. 3—Typical volt-ohmmeter useful for telephone circuit tests. This meter is a 10,000 ohms-per-volt type with four resistance ranges of 1 to 2,000 ohms, 10 to 20,000 ohms, 100 to 200,000 ohms and 1,000 to 2,000,000 ohms. The voltage ranges are as indicated.

On the other hand, a long farm cable may have a high capacitance, making it difficult to determine whether the meter deflection is due to the capacitance of the cable alone or to the combined capacitance of the cable and the subset condensers. This is because the ring condensers in rural subsets are generally low in capacitance, as compaared to the town sets. In such cases, little reliance can be placed on the meter deflections as an indication of the condition of the open-wire line beyond the junction with the cable.

Another factor affecting the degree of meter deflection is the sensitivity of the meter. Thus a 1000-ohms-per-volt meter will show five times the deflection of a 200-ohms-per volt meter for the same line capacitance. A ten-point deflection on the first meter would correspond to only 2 points on the latter meter. This fact should be kept in mind when testing at different offices using different types of line test panels. Operation of the reversing or foreign battery key, depending on the type of set used, will double the amount of throw the meter registers.

Resistance Readings On Voltmeter Tests

IT IS DESIRABLE to convert a volts or "points" reading to ohms in voltmeter "loop" or "ground" tests, in order to properly analyze a trouble case. The reason is that not all voltmeters have the same internal resistance. A voltage reading on a meter of a certain resistance will not correspond to a like reading on another meter of different resistance. For example, the ohms value for a reading of 40 volts (with 48 volts exchange battery) on a 1000-ohms-per-volt meter would be 20,000 ohms. On a 200-ohms-per-volt meter, the ohms value for 40 volts reading would be 3200 ohms.

This discrepancy would be confusing where several offices are visited by one man in the course of his work and he has to use different types of office test units. By converting all readings on "loop" and "ground" tests to ohms according to resistance table provided for each type of test panel, this difficulty will be avoided.

A further advantage is that where a portable ohmmeter is used in testing on the line, the resistance reading obtained on the office voltmeter can be used as the basis for comparison with readings obtained at other points on the line with the ohmmeter.

"It is not sufficient to merely provide a man with good test equipment and expect him to clear difficult cases of trouble in a few minutes."

Table II (See page 52) represents a typical table of resistance values for a 100,000 ohm meter. The formula used for computing the resistance values is the following

$$Rx = \frac{E-V}{V} Rm$$

where Rx = Resistance of circuit under test.

Rm = Resistance of meter.

E = Voltage of central office battery

V = Voltage reading on test.

The work of computing a series of resistance values for different voltage readings and different values of central office battery can be greatly simplified by using the E minus V over V multiplying factors listed in Table III (see page 54). To obtain the desired resistance value for any voltage reading, select the multiplying fact or corresponding to the reading in the column under the nearest central office battery voltage. Multiplying the factor by the resistance of the meter will give the proper resistance

(Please turn to page 52)

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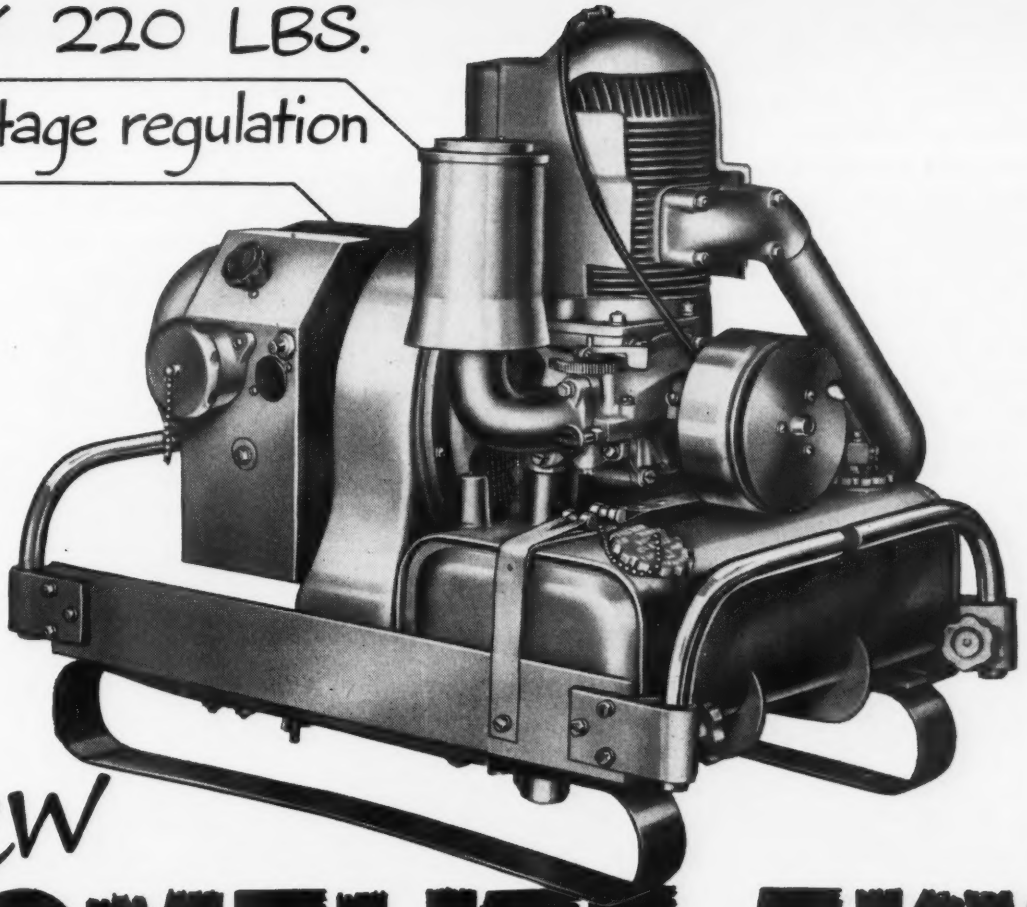

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value. A table can be made up in this manner from the multiplying factors and used for reference.

Initial Testing Procedure To Check Line Condition

BEFORE testing the line, the heat coils are removed from the line protector on the main frame or the jumper wires unsoldered at the terminal lugs on the cable terminal strip if removal of the heat coils would ground the line instead of open it. This opens the line for tests outward or inward and prevents bridged apparatus in the central office from interfering with the tests.

The test unit is connected to the line under test by means of the test cord provided. This cord is clipped onto the line terminals on the cable terminal strip.

If it is desired to make tests of the switchboard line equipment, the line is opened and the test cord is connected to the line terminals on the office side of the line protector on the main frame.

When using the voltmeter, each test should be made only after the voltmeter needle comes to rest on zero following the initial deflection resulting from the line capacitance discharging through the meter. If this is not done and the line has considerable capacitance, the readings may be in error.

When the test panel has provision for a foreign potential test, a loop test is made with no battery on the voltmeter to detect a foreign potential across the line (metallic connection). If a foreign potential is present on the line and the meter needle deflects off scale in the wrong direction, the reversing key is operated. If the voltage is too great, the shunt key is operated.

"Ground" and "loop" tests with battery on voltmeter are made as follows:

(1) Test for ground on ring (-) side of line. A deflection of the voltmeter needle would indicate ground on that side of the line.

(2) Test for ground on tip (+) side of line. A reading on the meter would indicate the presence of ground.

(3) Test for a short across the line. A deflection of the meter would indicate the presence of a short. If this test is made before making the ground test. and a reading is obtained, make the test for ground on the ring (-) side of the line. No deflection in this case would indicate that the deflection obtained in the preceding test was caused by a short across the line.

TABLE II

WITH SHUNT KEY IN NORMAL POSITION

Resistance Reading at 1000 Ohms Per Volt (Meter 0-100 Volts, 100,000 Ohms Resistance)

Volts Reading	Voltage of Exchange Battery 46	48	50	52
1	4,500,000	4,700,000	4,900,000	5,100,000
2	2,200,000	2,300,000	2,400,000	2,500,000
3	1,433,000	1,500,000	1,566,000	1,633,000
4	1,050,000	1,100,000	1,150,000	1,200,000
5	820,000	860,000	900,000	940,000
6	667,000	700,000	733,000	766,000
7	557,000	586,000	614,000	643,000
8	475,000	500,000	525,000	550,000
9	411,000	433,000	456,000	478,000
10	360,000	380,000	400,000	420,000
11	318,000	336,000	355,000	373,000
12	283,000	300,000	317,000	333,000
13	254,000	269,000	285,000	300,000
14	229,000	243,000	257,000	271,000
15	207,000	220,000	233,000	240,000
16	188,000	200,000	213,000	225,000
17	171,000	182,000	194,000	206,000
18	156,000	167,000	178,000	189,000
19	142,000	153,000	163,000	174,000
20	130,000	140,000	150,000	160,000
21	119,000	129,000	138,000	148,000
22	109,000	118,000	127,000	136,000
23	100,000	109,000	117,000	126,000
24	92,000	100,000	108,000	117,000
25	84,000	92,000	100,000	108,000
26	77,000	85,000	92,000	100,000
27	70,000	78,000	85,000	93,000
28	64,000	71,000	79,000	86,000
29	59,000	66,000	72,000	79,000
30	53,000	60,000	67,000	73,000
31	48,000	55,000	61,000	68,000
32	44,000	50,000	56,000	63,000
33	39,000	45,000	52,000	58,000
34	35,000	41,000	47,000	53,000
35	31,000	37,000	43,000	49,000
36	28,000	33,000	39,000	44,000
37	24,000	30,000	35,000	40,000
38	21,000	26,000	32,000	37,000
39	18,000	24,000	28,000	33,000
40	15,000	20,000	25,000	30,000
41	12,000	17,000	22,000	27,000
42	9,500	14,000	19,000	24,000
43	7,000	12,000	16,000	21,000
44	4,500	9,100	14,000	18,000
45	2,200	6,700	11,000	16,000
46	0	4,300	8,700	13,000
47		2,100	6,400	11,000
48		0	4,200	8,000
49			2,000	6,000
50			0	4,000
51				2,000
52				0

With shunt key operated, point off two decimal places to left to obtain correct resistance values.

Uses Of The Volt-Ohmmeter

THE VOLT-OHMMETER is useful for testing lines for shorts, grounds, crosses, opens, and high resistance connections. It shows the resistance of the circuit under test and thus indicates the exact condition of the circuit from the standpoint of leakage to ground or conductivity as a talking circuit. It is also employed to measure the voltage of a circuit where battery is present.

Ohmmeters are eminently satisfactory for trouble location purposes, but there is an advantage to using a combination voltmeter and ohmmeter. Because voltage readings can also be taken, the volt-ohmmeter can be used in magneto exchanges to check the voltage of transmitter batteries and, in common battery and dial exchanges, to determine the presence of battery in the circuit being

(Please turn to page 54)

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tested. When the voltmeter section is used to test for presence of battery, foreign or otherwise, before resistance measurements are made with the ohmmeter section, the possibility of damage to the meter is greatly reduced. A typical volt-ormmeter is illustrated in *Figure* 3.

The volt-ohmmeter is most satisfactory when it supplements other types of test sets used for locating trouble in lines and equipment. Sometimes the nature of the trouble is such that the regular test equipment cannot be satisfactorily used and the volt-ohmmeter can then be substituted to save time and effort in locating the fault.

For example, in the case of line tests, a magneto test set with inductive fault finder is very useful for determining the direction of the fault without having to cut the line wire for th's purpose. It cannot, however, be used for line tests when the resistance of the fault is high, as the tone current would be too low to be picked up by the finder coil. The volt-ohmmeter is not limited by the fault resistance, since it is capable of indicating any resistance value within its range. Such meters are available with a range as high as 20 megohms, though a range of up to 1 or 2 megohms is ample for the line tests.

Since it is necessary to open the line to make directional tests when using the volt-ohmmeter, it is well to employ the inductive fault finder test set for directional tests whenever possible and to use volt-ohmmeter when the magneto set cannot make a satisfactory test.

Table III — Multiplying factors for converting voltage readings to ohms.

$\frac{E - V}{V}$ *Multiplying Factors*

Voltage of Central Office Battery

Volts Readings	46	48	50	52
1	45	47	49	51
2	22	23	24	25
3	14.333	15	15.666	16.333
4	10.5	11	11.5	12
5	8.2	8.6	9	9.4
6	6.667	7	7.333	7.666
7	5.571	5.857	6.143	6.429
8	4.75	5	5.25	5.5
9	4.111	4.333	4.555	4.777
10	3.6	3.8	4	4.2
11	3.181	3.364	3.547	3.730
12	2.833	3	3.167	3.334
13	2.538	2.692	2.846	3
14	2.285	2.429	2.571	2.714
15	2.066	2.2	2.333	2.400
16	1.875	2	2.125	2.250
17	1.705	1.824	1.941	2.058
18	1.556	1.667	1.778	1.889
19	1.421	1.526	1.631	1.736
20	1.3	1.4	1.5	1.6
21	1.190	1.286	1.38	1.476
22	1.090	1.182	1.272	1.363
23	1.	1.087	1.173	1.260
24	0.916	1.	1.083	1.166
25	0.840	0.92	1.	1.08
26	0.769	0.846	0.923	1.
27	0.703	0.778	0.851	0.925
28	0.642	0.714	0.785	0.857
29	0.586	0.655	0.724	0.793
30	0.533	0.6	0.667	0.733
31	0.483	0.548	0.612	0.677
32	0.437	0.5	0.562	0.625
33	0.394	0.455	0.515	0.576
34	0.353	0.412	0.47	0.529
35	0.314	0.371	0.428	0.486
36	0.277	0.333	0.389	0.444
37	0.243	0.297	0.352	0.406
38	0.212	0.263	0.316	0.368
39	0.179	0.237	0.282	0.334
40	0.150	0.2	0.25	0.3
41	0.122	0.171	0.22	0.268
42	0.0953	0.143	0.191	0.238
43	0.0697	0.116	0.163	0.209
44	0.0454	0.091	0.136	0.182
45	0.0222	0.067	0.111	0.156
46	0	0.043	0.087	0.131
47		0.021	0.0638	0.106
48		0	0.0417	0.0834
49			0.0204	0.0612
50			0	0.04
51				0.0196
52				0

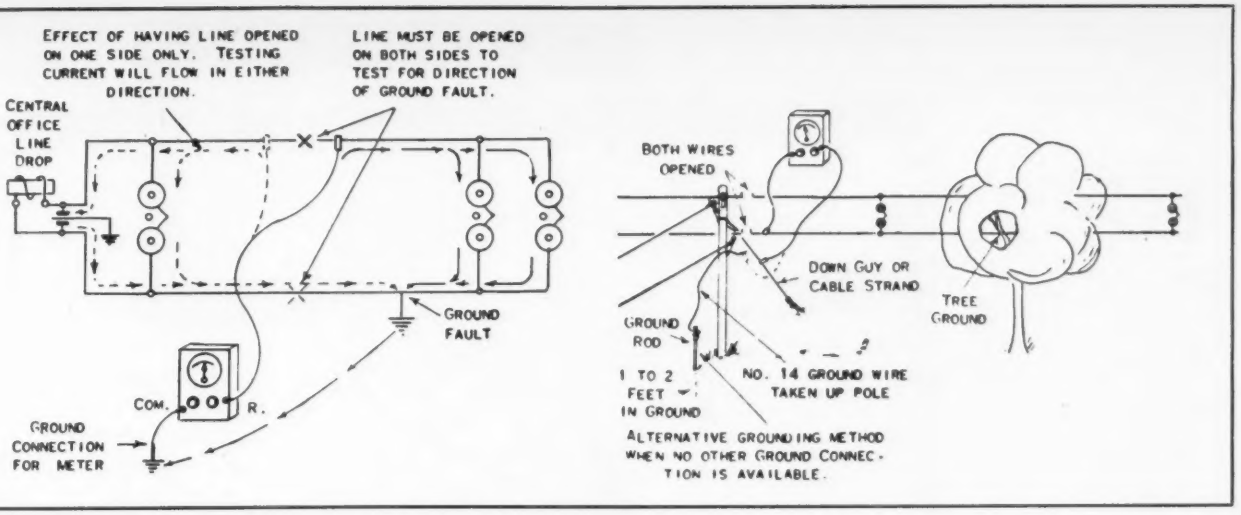
Using the Ohmmeter And Voltmeter Sections

THE TYPE OF instrument illustrated in *Figure* 3 has a standard moving-coil fixed-magnet movement, a zero adjuster and two penlite type dry cells for the ohmmeter section, a rotary selector switch for selecting the desired resistance range or voltmeter section, and pin-tip jacks for connecting the test leads. Three-or four-foot test leads with pin tips on one end and test clips on the other end are used for connecting the meter to the circuit under test.

The ohmmeter section has its scale calibrated to read in ohms. The internal battery provides the testing current. The zero adjuster, which is a rheostat in series with the meter movement and the battery, is used to adjust the meter needle to zero to compensate for the decrease in voltage of the series battery as the cells deteriorate.

When the terminals of the ohmmeter are shorted together, the meter will deflect full scale, indicating zero resistance. If an external resistance is connected to the ohmmeter terminals, the meter will deflect a certain distance proportional to the voltage of the series battery, less the voltage drop through the resistance. The higher the value of the resistance connected to the ohmmeter terminals, the smaller will be the meter deflection. Since the meter scale is calibrated in ohms, the position of the meter needle indicates the value of this resistance in ohms.

To use the ohmmeter section of the type of meter under discussion, the test cords are inserted in the "CON" and "R" tip jacks. The test clips are shorted together and the zero adjuster knob is turned until the meter needle rests on zero. The short is removed at once, the test leads are clipped to the terminals, leads, or wires of the line or equipment under test, and the reading is noted.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LINE MUST BE OPENED ON BOTH SIDES TO TEST FOR DIRECTION OF GROUND FAULT.
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COM.
R.
GROUND CONNECTION FOR METER
BOTH WIRES OPENED
DOWN GUY OR CABLE STRAND
TREE GROUND
GROUND ROD
1 TO 2 FEET IN GROUND
NO. 14 GROUND WIRE TAKEN UP POLE
ALTERNATIVE GROUNDING METHOD WHEN NO OTHER GROUND CONNECTION IS AVAILABLE.

Fig. 4 (Left)—Effect of opening only one side of the line in testing for a ground with volt-ohmmeter . . . . Fig 5 (right)—Testing for a tree ground.

The resistance range should be selected for the type of measurement being made. The highest resistance range should be used for locating a high-resistance leak. A high-resistance leak to ground that may be the cause of crosstalk or power line noise, will not show up on the lower resistance ranges. When checking a line for high-resistance splices, the lowest ohmmeter range should be used, particularly if individual splices are being tested. Splices with any measureable resistance are very apt to become noisy and must be cut out. A good splice has a resistance of a very small fraction of an ohm. The lowest resistance scale should indicate a resistance of at least one-half ohm which is sufficiently low to detect a splice that is going "high."

Associated with the ohms scale is a volts scale to enable a voltage reading to be taken when the test cords are inserted in the "COM" tip jack and one of the proper tip jacks in the voltage range section of the meter. To avoid damage to the meter, the highest voltage range should be used first and then the lowest range that will give a satisfactory reading.

The volt-ohmmeter is generally a rugged instrument and will stand a considerable amount of handling. Neverthless, it should not be dropped or be subjected to a heavy jar or to continuous vibration, as when being transported without proper protection in a truck. It should always be placed in a padded case when it is not in use. If it is carried up a pole, it should be securely held while on the pole to avoid the possibility of dropping it. It is a good idea to provide a small leather case with looped strap by which it may be suspended from the body belt or shoulder strap of the tester's overalls.

Since the meter has a very sensitive movement, care must be taken not to connect the ohmmeter section to a circuit which carries an alternating current or a direct current. The ohmmeter section is intended only for testing dead circuits.

In the magneto plant, there is little likelihood, except at the switchboard or telephone instrument of connecting the ohmmeter section to a circuit on which a voltage is present. In the common battery or dial plant, all central office lines carry 24 or 48 volts. This voltage is sufficiently high to burn out the moving coil or bend the meter needle, if the ohmmeter is connected to a line from which battery has not been removed. Checking the line first with the voltmeter section of the meter will indicate if there is actually a voltage present and thus protect the meter in case connection is inadvertently made to a line that has battery on it.

AN OPEN MIND leaves a chance to drop a worthwhile thought into it. — *Sales Maker.*

In time, the dry cells in the instrument will deteriorate to the point where the battery voltage is too low for satisfactory operation of the ohmmeter section. At this point, the meter needle will not set on zero when the zero adjuster is turned as far as it will go. It is then necessary to replace the cells.

Using the Volt-ohmmeter In Magneto Line Tests

BEFORE proceeding to locate a case of trouble reported to be in a subscriber's line, it is advisable to determine if the fault is inside or outside the magneto office. If no wire chief's voltmeter is available, the heat coils should be removed from the main frame protector and the ohmmeter used to determine the direction of the fault, after which the coils should be replaced.

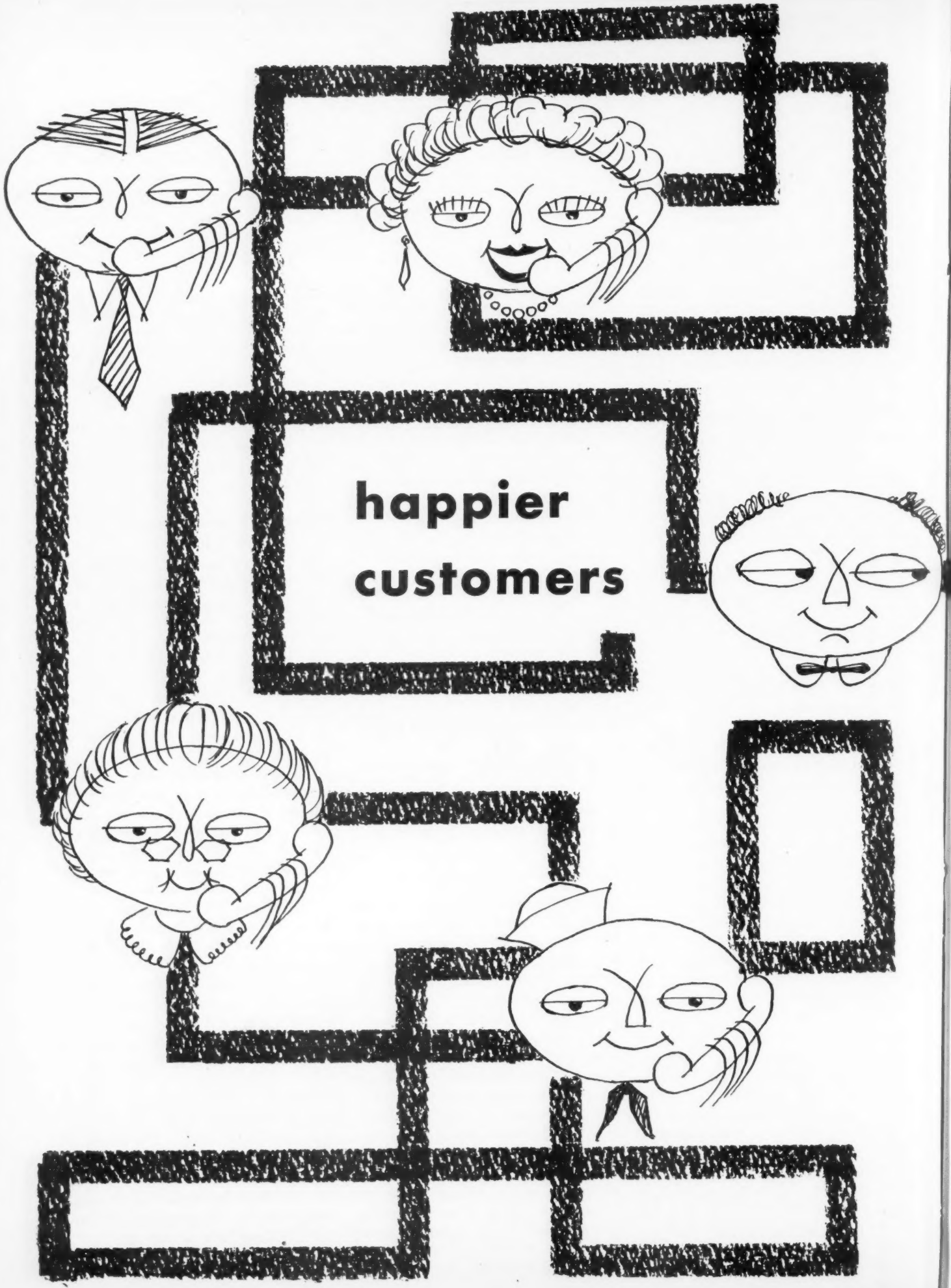
Magneto lines other than the simplex push button type should not be opened at the main frame for tests made out on the line. Leaving the line connected in the office enables talking tests to be made with the assistance of the operator, if so necessary.

In the case of simplex push button lines, the retard coils that are connected across the line with the drop between center tap of the coils and ground will interfere with the test. Both sides of the line accordingly should be opened at the main frame or at a testing point before using the volt-ohmmeter for tests.

Locating A Ground Fault On A Magneto Line

IN DETERMINING the direction of a ground fault on a magneto line, both sides of the line must be opened for the test; otherwise the bridged bells will tie the two sides of the

(Please turn to page 83)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toll business, are certainly better prospects
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This wonderful Leich 900 magneto telephone
was designed to make your customers
pleased and proud of their telephone service.

Look at it. It's just as compact,
modern and attractive as a regular
common battery or dial telephone.
Crank it. The handy generator crank,
located on top, makes ringing
the operator as easy as dialing.
Talk over it. Never have you
experienced better transmission or reception.

make you richer

Give your customers their
choice of wall or desk installation.
It's no trouble for you.
This remarkable Leich 900 magneto telephone
can be used either way
without any changes or additions.

This is the kind of telephone
magneto subscribers can get enthusiastic
about. People you thought would
never *sign up for telephone service*
will see and use this Leich 900
and become paying customers.

Smiling faces will make it more pleasant
and possible to do business . . . profitably.

Please pardon our enthusiasm,
but we know . . . . Leich magneto telephones
are *building goodwill . . . . .*
in **thousands** *of exchanges.*

Write today for catalog and prices.
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427 W. Randolph, Chicago 6, Illinois.

LEICH **MANUFACTURERS OF TELEPHONES, SWITCHBOARDS AND RELATED APPARATUS SINCE 1907**

New York Telephone Co. employees watch cable leaving reel. Handie-talkie is used to talk to winch truck and coordinate pull of winch with lasher.

LOOKING IN ON

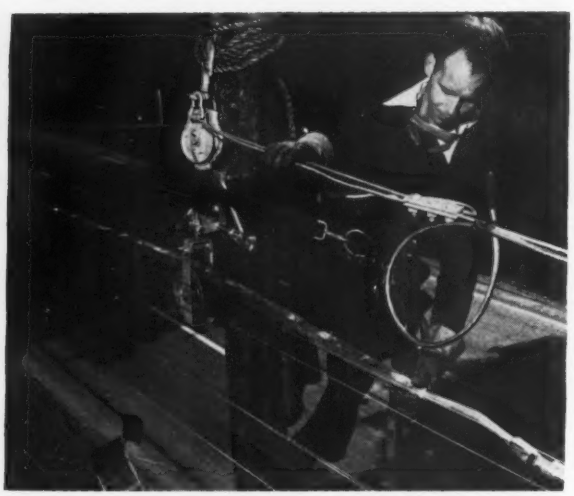
PLACING CABLE WITH THE

A MECHANICAL spider is reducing cable placing time for Plant men these days. According to TELEPHONE REVIEW, there is nothing much new about the spider, but what is new is that it now does its spinning on the ground instead of in the air.

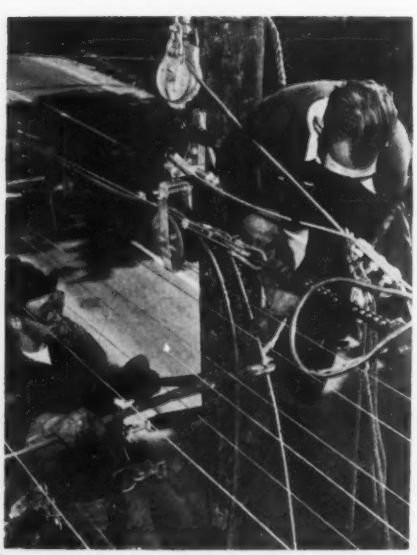
This mechanical aid, the cable lasher, has been familiar to telephone company plant men for some time. In the conventional method it spins a fine wire around the strand and cable as it is pulled along the strand, already positioned high between the poles.

The new method prelashes aerial cable and its supporting strand from the ground by mounting the lasher on a trailer. Both strand and cable are mounted on the same trailer and, by an ingenious set of pulleys and rollers, pass through the lasher together, pre-tensioned by a hydraulic braking system. The spiral wire is spun around them as they pass through. From there the lashed strand and cable are pulled up to and through a temporary block on the first pole and through blocks on successive poles by the winch line of a truck.

Developed by Bel Labs and AT&T's O & E department, the new system has many advantages. Formerly poles had to be climbed three or four times — to place blocks, to lay strand and pulling-in wire and to transfer the lasher around the pole. Now only two climbs are necessary — to place the temporary block and to transfer the strand to a permanent hanger. Blocks placed between



Lineman checks anti-twist leader as it passes through temporary hanger assembly. Hinged weights prevent length of cable and strand from twisting.



Workers cut newly-placed strand to release ladder. Chain hoist supports weights of both cable.

Top block supports cable and strand placed day before. Strand is cut before joining it to strand newly placed.

THE NEW PRE-LASH METHOD

poles to support the cable are eliminated. Service interruptions caused by the contact of placing equipment and open wire are almost eliminated. There is more uniform tensioning of cable and lashing wire and no chance of the lasher slipping uselessly along a strand coated by ice or snow.

Reliable Electric Company's STRANDLINK is a standard means for splicing the steel strand wherever necessary. Its small diameter and streamlined contours make an ideal splice for riding thru the blocks without damage to the lead sheath. STRANDVISE is also part of the equipment, being used as a removable grip to hold the forward end of the steel strand under tension in the leader. It appears that STRANDLINK and STRANDVISE were important factors in the development of the pre-lashing equipment.

At present, there are some limitations. The diameter of cable to be pre-lashed can not be more than 1.3 inches for alpeth and 1.1 inches for lead. The length of cable that can be placed in one operation is limited to 2,500 feet mainly because that is the maximum amount of line, used to pull the cable and strand, that the truck winch will handle. Since both the lasher and truck winch have to be positioned well back from the pole at each end to reduce the angle of pull some locations are not practical because of traffic conditions or space limitations.

Bell people hope that some day all cable can be pre-lashed by this method.

Strandlink is used to splice the steel strand. A cableman will splice the cable.

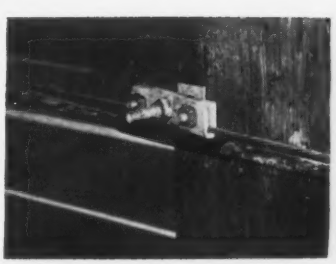
Lineman uses cable transfer tool to support cable and strand, first step in shifting cable from block to permanent hanger.

"E" cable block is removed from temporary hanger frame. Hooks, each side, support cable weight.

Cable suspension clamp is placed on through bolt for permanent attachment of strand to pole.

Cable block frame (temporary hanger) is removed from pole.

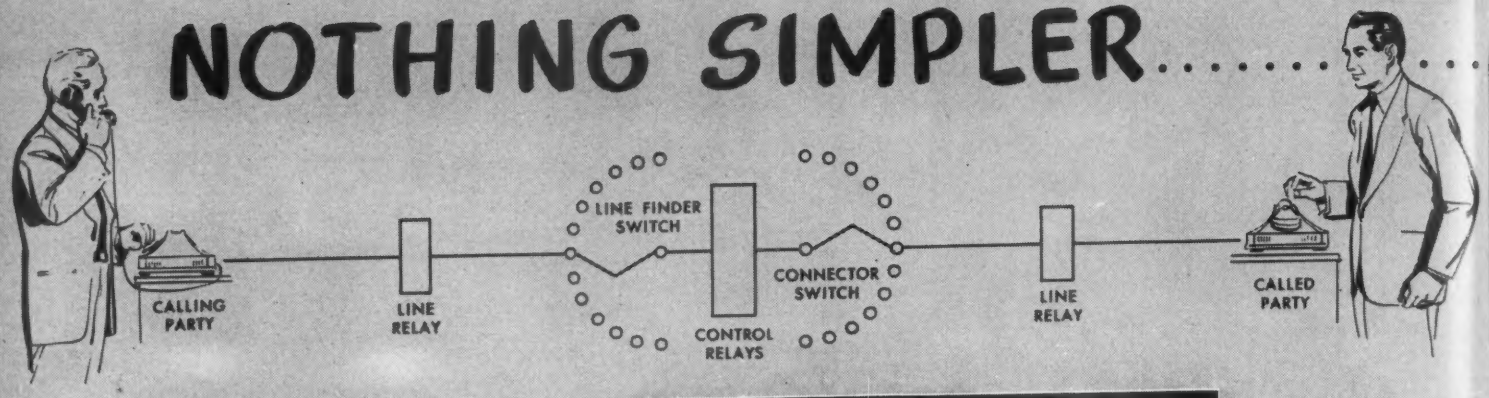
Polyethylene shield completes transfer, protects cable from hanger damage.

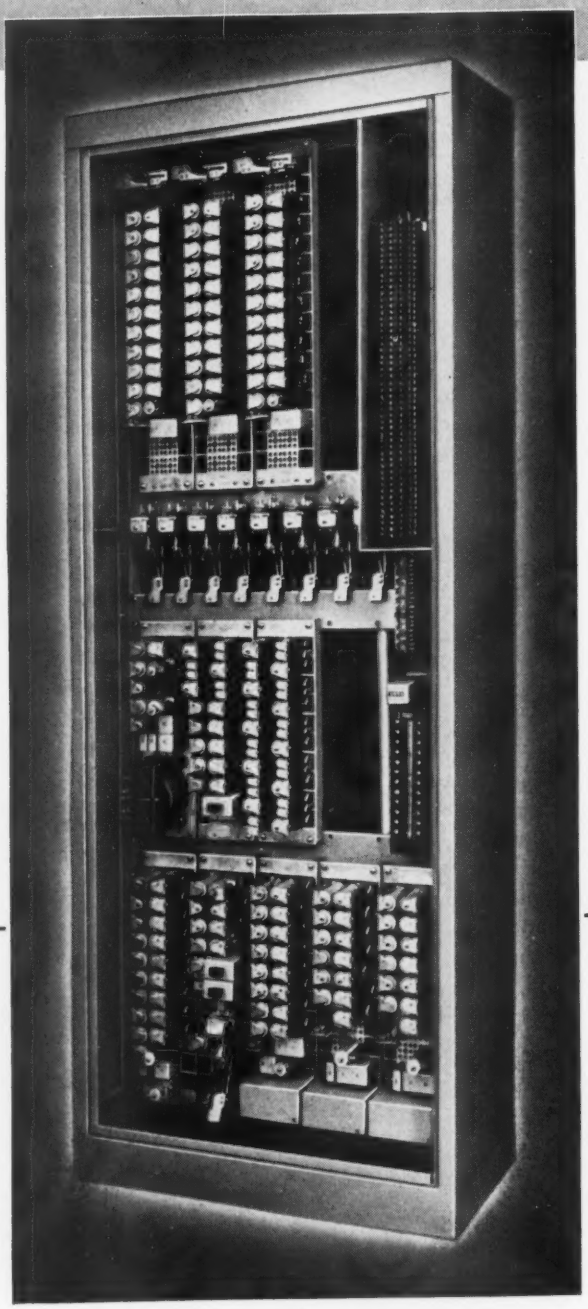


Close-up of permanent hanger, after transfer. Lineman moves on to next pole.

Thanks to G. R. Williams, Jr., editor of New York Tel. Co.'s TELEPHONE REVIEW for granting permission to reprint this article.

NOTHING SIMPLER.....





The Board With The "100-year" Switch

....Nothing More Dependable

Type 48 Switch-Type C-A-X

For your small exchange

How simple can automatic switching get?
Look at the diagram at the left and see!
Note how a connection speeds between calling and called party
by a short series of *logical straightforward steps.*
We think you'll agree there's nothing so easy to understand
—nothing so simple as our Type 48 C-A-X!

Type 48's simplicity pays off in minimum working parts
—and in fast, easy checkups by a distant operator.
These routine checkups are about the *only* attention it ever needs!

Type 48's unusual dependability is due to its *switch-type* mechanism
—built around the Type 45 "100-year" rotary switch.
This switch has successfully passed life tests equivalent to
more than *100 years* of continuous exchange operation!

We supply Type 48 in 20- and 40-line standard models.
You may order it partially equipped and add lines quickly, easily,
by adding fully-wired components.
Type 48 provides all the services your small exchange needs.
It enables you to use up to eight revenue-building paystations.
It can connect with your other automatic exchanges
to form an economical-to-operate automatic network.

Write today for new Circular 1795. Get the facts
—you'll be convinced Type 48 is your safest investment!

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Section XV-E of Mr. Reed's article discusses — (1) Current supply for operators' headset equipment, and (2) Battery eliminators for operators' transmitter supply.

Modern CENTRAL OFFICE Maintenance

By JOHN S. REED

HOWEVER, as in the case of the older type sets, trouble points are the connections at the terminals in the transmitter plug (on transmitter arm), in the receiver, at the tie cord clasp on the cord, and at the cord plug. The cord becomes noisy at these points from wear on the tinsel conductors. The tie cord at the receiver and cord plug may also break, placing a strain on the conductors. Occasionally, the transmitter wires inside the arm breaks from excessive twisting of the transmitter on the arm. The arm also may loosen inside the receiver and swing down. This requires opening the receiver, unscrewing the jointed back of the receiver case, bending the inside spring plate to make it hold the parts together tighter. As previously pointed out, proper training of the operators in handling of their sets will reduce maintenance work on these sets to a minimum.

Maintenance of Operator's Transmitter Current Supply

ONE IMPORTANT cause of poor transmission in operators headset equipment is insufficient current supply for the transmitters. In common battery exchanges the current is furnished by the central office battery or in the case of large offices, from a separate bank of storage cells. This assures a constant voltage and adequate current supply.

In the case of magneto offices, the situation is different. The operator's transmitter supply usually consists of primary cells which must be carefully maintained to provide the desired output. If the cells are neglected, the voltage will drop as the cells become exhausted. This gradual drop reduces the current supply and results in poor transmission which is especially detrimental to toll service and causes irritation to the operators as well as the subscribers.

Wet type primary cells are generally used in preference to No. 6 dry cells, since they have a more stable output than the dry cells. They are generally of 500 ampere hour capacity and have a potential of .65 to .5 volt per cell, depending on the discharge rate. Because of the low

Fig. 247 — Showing correct position of Type 52 operators head telephone for comfortable wear and good transmission. Note that transmitter arm is adjusted to follow the jaw line for least interference with vision and to place the transmitter ½ inch from and to one side of the mouth.

voltage of the individual cells, it is necessary to connect five such cells in series for the operators transmitter supply. With proper care they will last three to four years before requiring renewal of the elements.

The maintenance procedure for wet cells consists in occasional inspection of the cells to observe when the elements are becoming exhausted and to watch for overflow or leakage of the electrolyte. If the cells are not carefully attended to, they may cause trouble by overflowing or leaking through unnoticed cracks in the jar. This results in a messy condition and may damage the rear woodwork of the switchboard.

When the cell elements become exhausted, they should be replaced promptly. The old electrolyte should also be discarded and the jars thoroughly cleaned and inspected for cracks. Care should be taken in preparing fresh solutions of electrolyte (caustic soda) for refilling the jars. The correct proportions of caustic soda and water should be added with due care as the solution becomes very hot. After cooling, the new elements are inserted and with the cover set to one side on the jar edge, battery oil is carefully poured in top of the electrolyte to prevent evaporation of the solution. The oil should not be allowed to come in contact with the plates nor should the good elements be lifted out before they are exhausted. Fresh chemicals and new battery elements are available from the manufacturer.

Another type of primary battery that is well suited for operators transmitter supply is the air-depolarized type such as the Eveready Air Cell which has an output of 2.5 volts for a 2-cell unit at 0.65 ampere drain, providing 600 ampere hours. When installed in modern switchboards drawing 0.1 ampere, they will supply current for 6000 hours.

The general procedure is to use two of the 2-cell units to provide a maximum of 5 volts and a minimum of 4 volts or one single cell unit and one 2-cell unit in series to furnish 3.75 volts maximum and 3.0 volts minimum. When purchased, they are in the dry state, but can be activated for service by adding ordinary tap water.

Two important precautions should be observed in the use of the air depolarized cell. The cellophane covering on the upper surface of the carbon electrode must be removed when the cell is placed in service to permit absorption of air to produce the depolarizing action. The battery must not be permitted to operate continuously at a greater current drain of 0.65 ampere at a temperature of not less than 45°F.

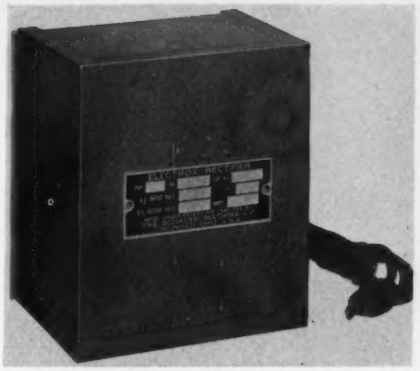


Fig. 248 — Electrox Type PA-05004 rectifier for operators circuit in magneto switchboards. For lamp signal and automatic switchboards, another model is available to provide the desired voltage and current output. Courtesy of Schauer Manufacturing Company.

Fig. 250 — Raytheon Rectifilter designed to furnish 24 volts at ½ to 6 amperes for magneto switchboards with lamp supervision, also for private branch exchanges or other applications requiring humless direct current at 24 volts.

Battery Eliminators For Operators Transmitter Supply

WITHIN recent years, battery eliminators have come into use to replace the primary battery for operators transmitter supply. They have the principal advantage of requiring very little or no maintenance. One type of eliminator for providing direct current supply without the use of batteries except for standby service is illustrated in Figure 248.

Operating directly from 110 volts 60 cycle a-c mains, this rectifier delivers a constant humless direct current (0.5 ampere at 4 volts) to the operator's circuit in magneto switchboards. Where the alternating current is subject to frequent interruptions, a power-off relay is incorporated in the battery eliminator and when the power fails, the operator's circuit is

(Please turn to page 66)

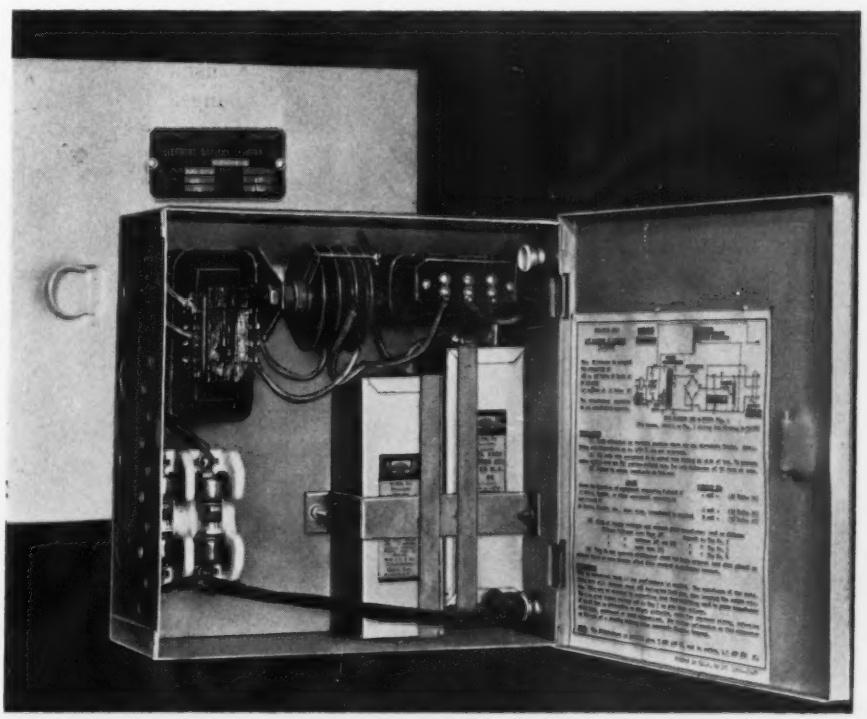
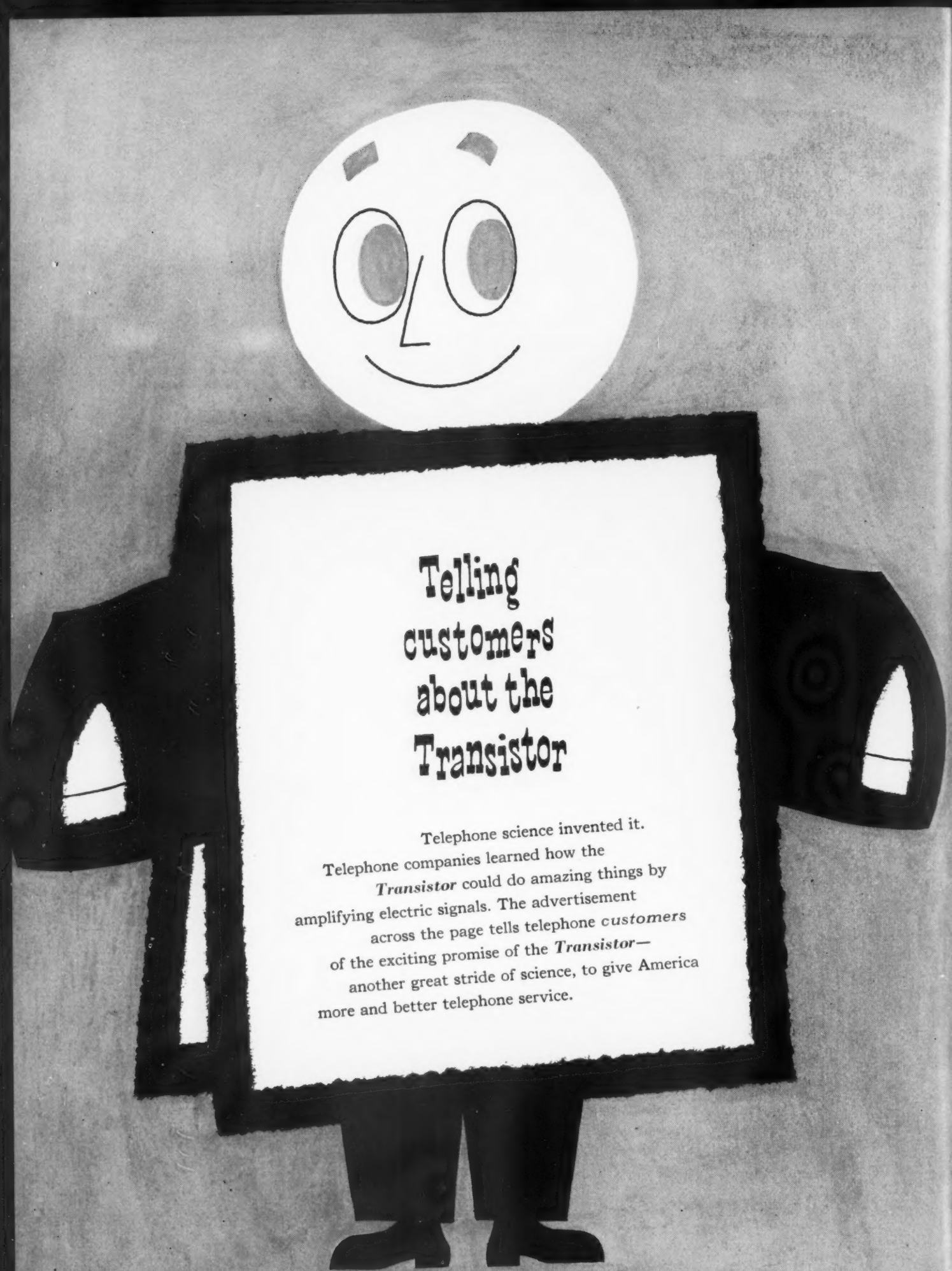


Fig. 249 — Automatic Electric Type 45 battery eliminator delivering 12 volts, 1.5 amperes of humless direct current for intercommunicating systems fo automatic, manual, or pushbutton type, or for any other application where filtered direct current of the indicated rating is desired.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customers
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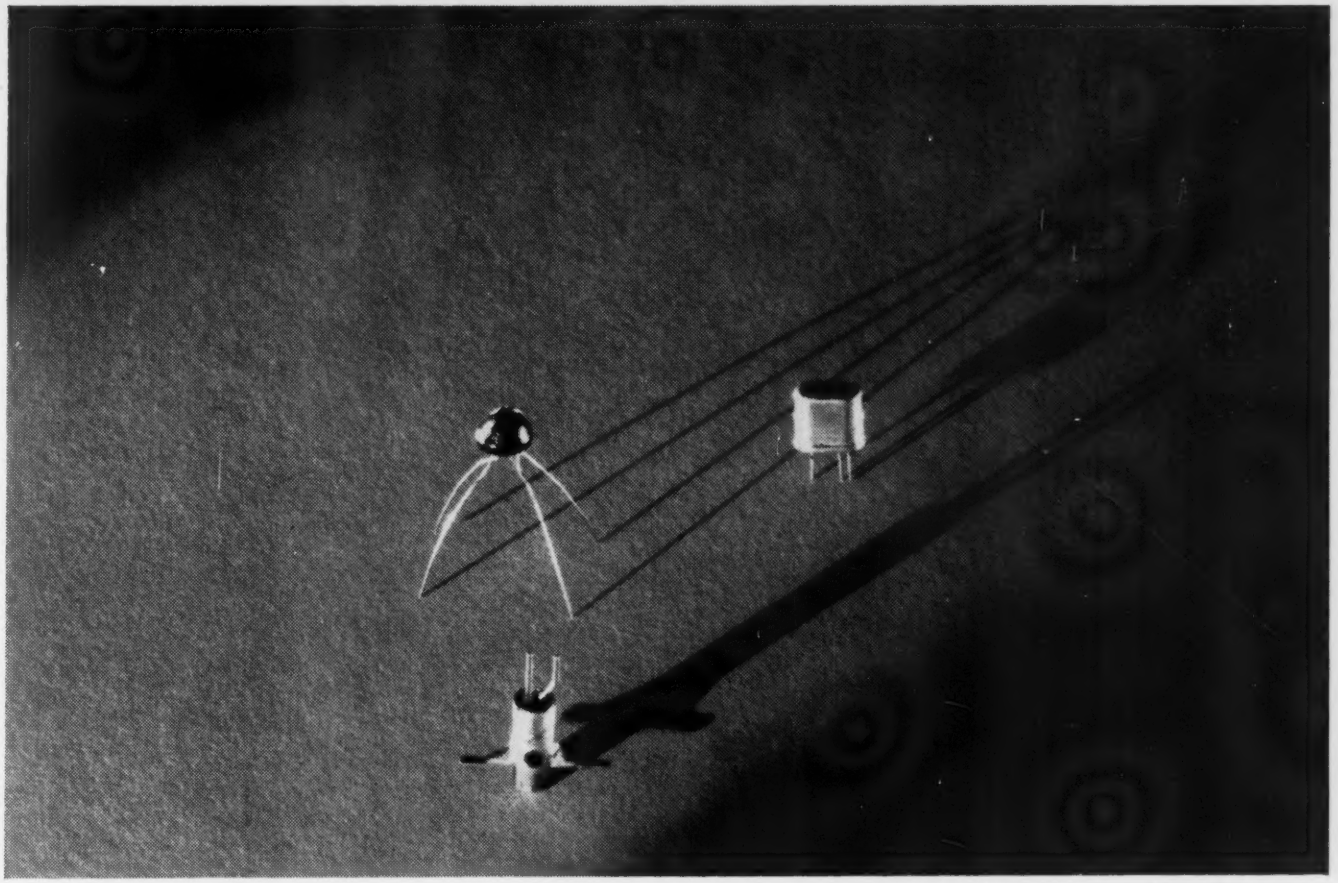
of the exciting promise of the *Transistor*—
another great stride of science, to give America
more and better telephone service.



WHAT IS THE TRANSISTOR? It is a tiny electronic device that can do amazing things for you by amplifying electric signals. It requires only a fraction of the power of a vacuum tube. It will be low in cost and last many times longer. Three types of ***Transistors*** are shown above, about actual size.

That's the LITTLE GIANT with the Big Future

The ***Transistor*** — invented at Bell Telephone Laboratories — opens new doors to far-reaching improvements in telephone service and in other fields

Many important inventions for communications have come from the Bell Telephone Laboratories. Seldom, however, has there been a new discovery with the exciting promise of the ***Transistor.***

This tiny device can amplify electric signals a hundred thousand times. It can do many things that vacuum tubes can do and many more besides. It is something entirely new, and works on entirely new principles.

Because it is so small and rugged, and takes so little power, it can be used in ways and places beyond reach of a vacuum tube.

Invented at the Bell Laboratories to amplify the voice in telephone service, the ***Transistor*** is opening new doors of opportunity in other fields.

The Bell System has licensed thirty-eight other companies to make and sell transistors under its patents. This is in accordance with our established policy of making our inventions available to others on reasonable terms. These include makers of advanced equipment for defense, as well as radios, television sets, hearing aids, and a wide range of electronic apparatus.

The ***Transistor*** is already being used in the new electronic equipment which enables telephone users to dial Long Distance calls from coast to coast.

It is another example of the value of Bell System research in bringing you more and better telephone service.

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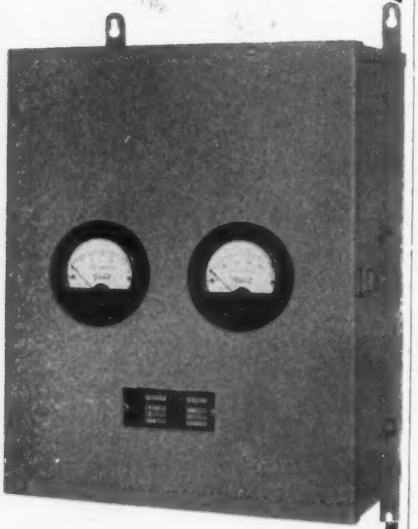
for Years-
and Years-
and Years-
of Service!



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In sizes and capacities to meet every telephone power requirement.

See your Electrox Jobber.
Write for Bulletin 1465.

*T.M. Reg.

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automatically transferred to stand-by dry cells. Since these cells will be used only occasionally they will be serviceable for a period corresponding to their shelf life. When the eliminator is used to supply current to two or more operator's positions, an impedance unit should be obtained from the manufacturer for each position to prevent crosstalk between operator's circuits in different positions.

Another type that produces 1.5 amperes at 12 volts is illustrated in Figure 249. It is designed to produce humless current within its rated capacity for any intercommunicating system of the automatic, manual, or push button type, or for any other application where filtered 12-volt direct current of up to 1.5 amperes is desired.

For 24-volt systems, the eliminator illustrated in Figure 250 is well suited where an output of ½ to 6 amperes at 24 volts of direct current is used. While it is designed primarily for private branch exchanges within its capacity, it can be used in magneto switchboards equipped with lamp supervision operating from 24-volt direct current supply. For operator's transmitter supply in regular magneto switchboards, a smaller model is available that furnishes 0.23 ampere at 4 volts.—To Be Continued.

"Just Small Ones"

A reporter in a small Missouri community put in a telephone call for number 5085-W2.

"Did you say 5085-W2?" asked a male supervisor substituting for the regular woman operator.

"Yes," replied the reporter.

"Is that a rural number, ma'am?"

"I'm not sure."

"Just a minute, please." Slight pause.

"Would you hang up and try again, please? I'm kind of new at this, and I'm handling only the little numbers."

Test Questions on Section XV — Maintenance of Switchboard keys: Relay Features Maintenance of Relays; Adjustment of Relays; Current Flow Sets Used in Relay Adjustments; Maintenance of Operators Telephone Sets; New Light-Weight Operators Telephone Set; Maintenance of Operator's Transmitter Current Supply; Battery Eliminators for Operator's Telephone Supply.

(1) What are the common causes of trouble in switchboard keys?

(2) Describe the steps involved in correcting contact trouble in keys. What is the purpose of burnishing the spring contacts?

(3) What is the function of a telephone relay? Name the parts usually found in a relay.

(4) List the causes of relay failure. What is the common method of preventing operational failure due to foreign matter in contacts?

(5) State the preferable method of cleaning relay contacts. What is the objection to using a file on the contacts?

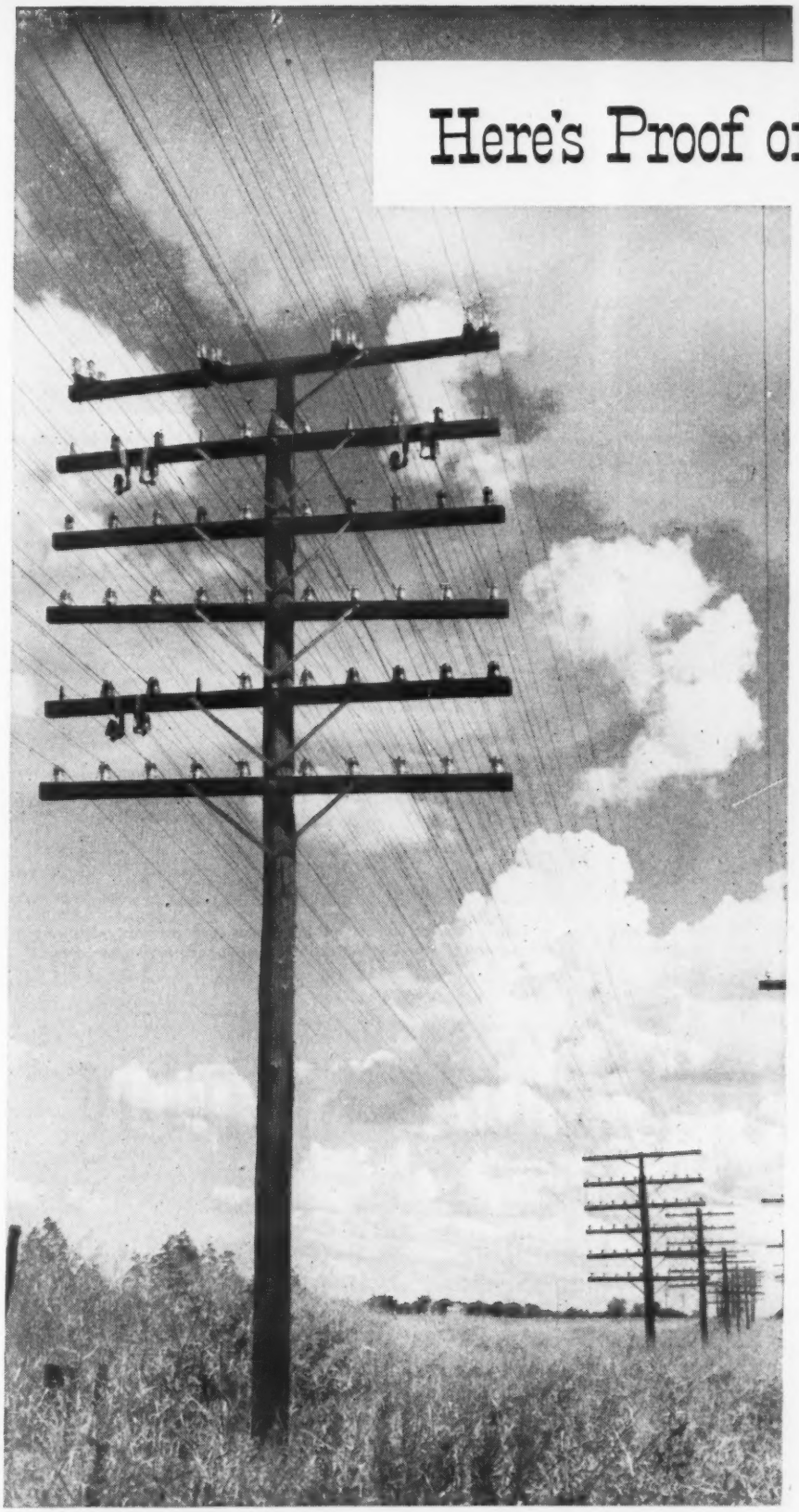
(6) Before a relay can be adjusted, what checks should be made? What is the purpose of gauging the armature stroke?

(7) How is a current flow set used in adjusting relays?

(8) What is soak current? Leak current? Define the terms "operate," "non-operate," "hold," and "release."

(9) What would be the effect of trouble in an operator's telephone set?

(10) Describe the method of caring for an operator's battery of the wet-cell type. What is the advantage of a battery eliminator where local battery is used for operator's transmitter supply?



THESE PRESSURE-CREOSOTED POLES, owned by Southwestern Bell and located near Highway 75 between Dallas and Houston, Tex., have been in service since 1912.

Here's Proof of Performance...

Southwestern Bell has had 40 years of service from these pressure-creosoted poles

● In 1912, Southwestern Bell Telephone Company erected these poles to carry a toll line from Dallas to Ennis, Tex., as one link in a through route from Houston to Dallas. A total of 1240 poles were erected in the 31-mile section and each was pressure-treated with Creosote Oil at 6 pounds retention.

Today—40 years later—more than 42% of the original poles are still in service. Most of the replacements took place in 1948 when the line was given a major overhaul. The poles left in place at that time were sound, showed no signs of rot or splitting, and appeared good for 5 to 10 years of additional life.

When you use a wood preservative, let service records like this be your guide. They are another good reason why users of preserved wood make Creosote Oil their first choice.

Creosote Oil contains not one but many compounds whose toxicity and permanence ward off attack by such wood destroyers as termites, fungi, dry rot and marine borers.

When you use treated wood, be sure it is pressure-creosoted with U·S·S Creosote Oil. It is the product of continuous processing in the world's biggest tar distillation plant. For complete information, contact our nearest Coal Chemical sales office or write directly to United States Steel Corporation, 525 William Penn Place, Pittsburgh 30, Pa.

U·S·S CREOSOTE OIL

USS

UNITED STATES STEEL

Fig. 1—The only tools and material required to install Channell C-3 cable terminal.

Fig. 2—Cable terminal mounted on pole bracket for self-supporting "Ankoseal" cable

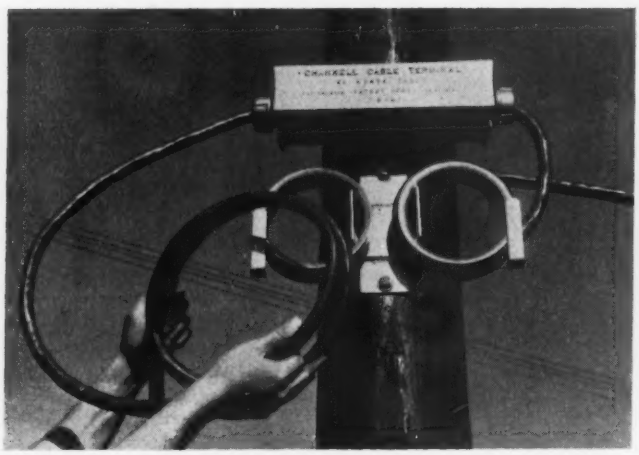


Fig. 3—26-pair, 19-type cable is pulled through terminal and placed in Channell Support. One foot of slack is left at each terminal.

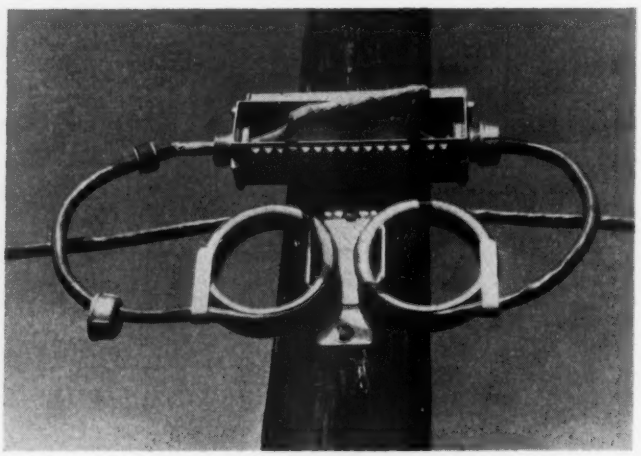


Fig. 4—Splicer opens up the cable, makes end gaskets with roll of rubber tape, pulls slack into terminal, and seals the ends.

Reduce Aerial Cable Splicing

By J. M. Channell*

"There is no good reason for cable splicing costing so much today . . . Use of methods developed 40 years ago contributes to today's high splicing costs."

WE HOPE to show in this article how 75 per cent of aerial cable splicing can be eliminated, over 50 per cent of material and tools saved, how a splicer can double his production and complete 75 per cent of aerial splicing without a helper.

Cable splicing has always been a costly job and quite a mystery to some telephone companies. Splicing started as a mystery years ago when plumbers were hired as splicers because they could wipe joints. They brought their helpers, metal pots, furnaces, wiping clothes and many ideas that were good in those days but are costly and out of date today. Many of these old ideas are still with us. There is no good reason why cable splicing should be a mystery and cost so much today. The fact that we are still doing the splicing about the same as we did 40 years ago should indicate that this may be our trouble.

*Mr. Channell is president of the Channell Splicing Machine Co., El Monte, Calif.

Aerial Splicing, Old Method

IT IS CUSTOMARY on new construction to place about six to 10 terminals on a 51-pair cable. These terminals are placed on a pole bracket or bolted to the strand. This operation requires some time. A splicer with helper and complete set of tools moves on the job. He goes to the end of the 51-pair cable, where it will splice into the main cable. He clears the end and wraps it up. He then goes

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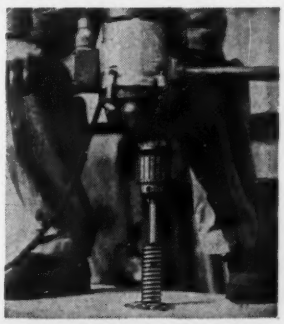

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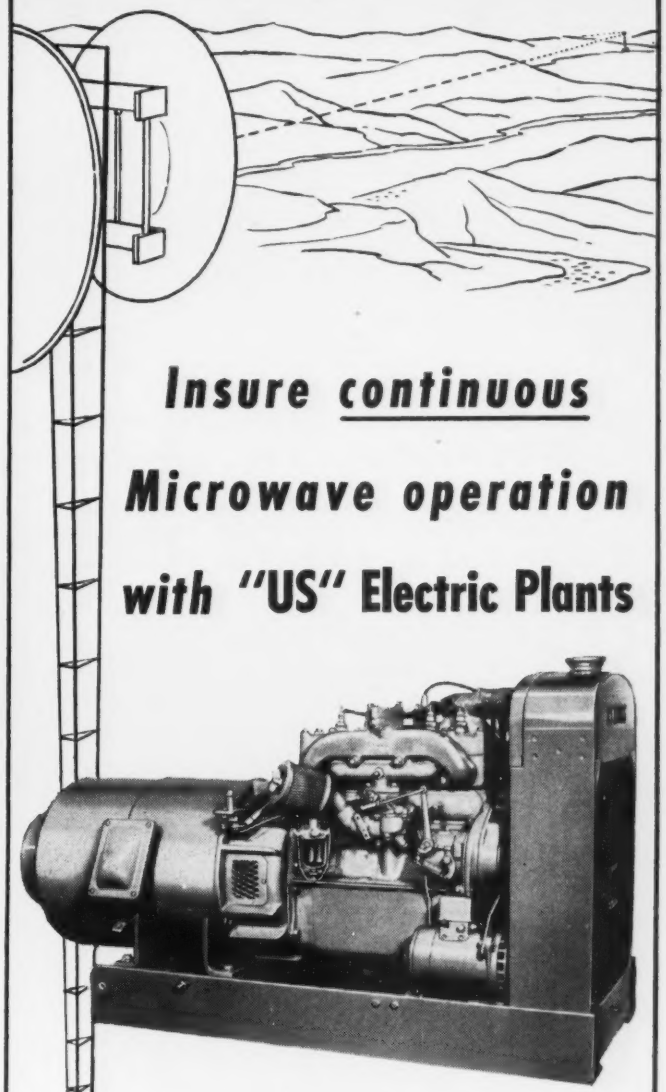

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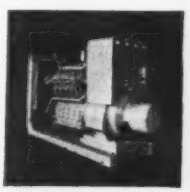
Dependability in "U.S." Electric Plants is the result of good design, rugged construction, and freedom from "gadgets." The unit shown is 12.5 KVA, 120/240-Volt Alternating Current. Write for information on the many "U.S." units built for Microwave service. "U.S." personnel is active in the design and development of microwave engine-generator sets in conjunction with R.T.M.A.

"U.S." builds hundreds of Electric Plant models (possibly the largest line made anywhere) — from 300 watts to 200 KW, AC and DC. Powered by gas, gasoline and diesel.



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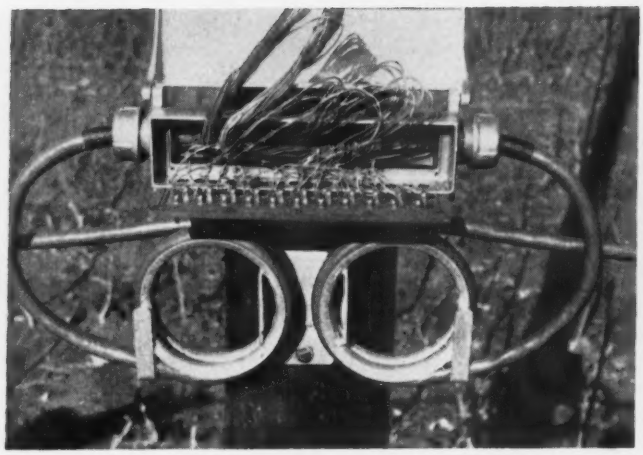

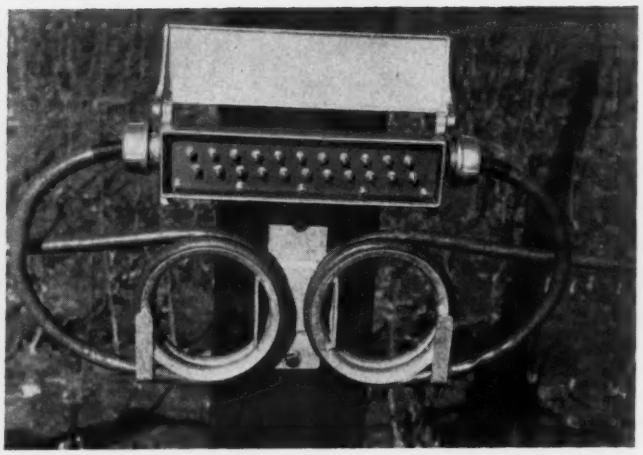

Fig. 5 (left)—Splicer picks up the count from the testboard, terminates pairs on back of faceplate, places unused wires in back of terminal, and seals faceplate . . . . Fig. 6—Channell cable terminal, No. C-3 installed.

to the end terminal, hangs platform, opens cable, splices in terminal, wipes joints on sleeve, lowers platform, bunches terminal, and moves to the next terminal.

At the second terminal he opens the 51-pair cable, sets up and opens terminal stub, tests terminal pairs with helper, picks up bunched pairs from first terminal, sends helper to first terminal to take off bunch and they identify the count by talking on each pair. The helper rebunches the terminal and returns to the splicer. This is done on every terminal cut in. The splicer cuts each pair in the main cable that is required for the terminal, pieces them out, and then splices in the terminal pairs. In some cases where the terminal is a 26-pair. the splicer will splice 52-pair. He then wipes up sleeve, lowers platform. bunches terminal and moves.

These are not all the operations required to cut in a terminal, especially on plastic cables and the process requires going back to the terminals after they are installed.

All of these operations are unnecessary and costly. The extra climbing of the poles, wiping the joints and handling of the platform are dangerous to the workmen. The cutting and piecing out of the pairs is dangerous to the service .

Figures *One* through *Seven* il-

SQUEAKING
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CRACKLING
CREAKING
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NOISY CONNECTIONS
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Nicopress Sleeves and Nicotaps
Nicopress Sleeves and Taps give you *permanently* quiet connections! They clamp tightly onto the conductors—insure rigid, sealed electrical contacts. No dirt can enter. No corrosion can form, to cause high resistance joints. Eliminate noisy connections with Nicopress Sleeves and Taps *today!*
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A Western Electric production team assembling governors which control the speed of telephone dials.

Small example of a big idea!

Some of our production teams are small—others are large. But the big idea of *teamwork* goes into the making of almost everything Western Electric produces for the Bell System.

And our teamwork goes far beyond *manufacturing methods.* Always our people work most closely with the Bell Telephone Laboratories people who *design* the equipment and the telephone company people who *operate* it.

In addition to doing the regular job of supplying telephone equipment to the operating companies, the Bell System research and manufacturing team is hard at work today for Uncle Sam—producing complex electronic equipment and military communications equipment to help make our country stronger.

Western Electric

A UNIT OF THE BELL SYSTEM SINCE 1882

"The only way to increase splicing production is through new methods and the use of new tools and materials."

(Continued from page 70)

Figures *One* through *Seven* illustrate how a Channell Cable Terminal (No. C-3 or C-4) is installed on plastic sheath cable. In the procedure the splicer *without helper* and *Complete set of tools* goes to the end of the cable where it will cut into the main cable and places new type splicer's testboard.

The terminal is completely installed without helper, testing of the terminal, splicing, wiping or bunching and it is not necessary for the splicer to return to the terminal for any reason after he has moved. When all the terminals are cut in, the 51-pair cable is ready to splice into the main cable from the testboard. This is the only splicing required on the 51-pair cable. With this method the only splices necessary, are those at the end of a reel, change of size or where the branch cable splices into the main cable. When a splice is necessary it is made at the terminal (butt spliced) and placed in the terminal.

This same terminal can be mounted on strand, pole or building the faceplates are interchangeable, the count can be increased or changed by removing the faceplate, and, if necessary, the terminal can be removed from plant at anytime, due to the slack that is left in each terminal.

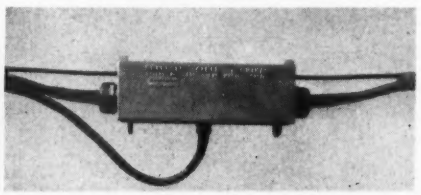


Fig. 7—Channell C-4 cable terminal installed on 202-pair cable with 51 pair branch (lead sheath).

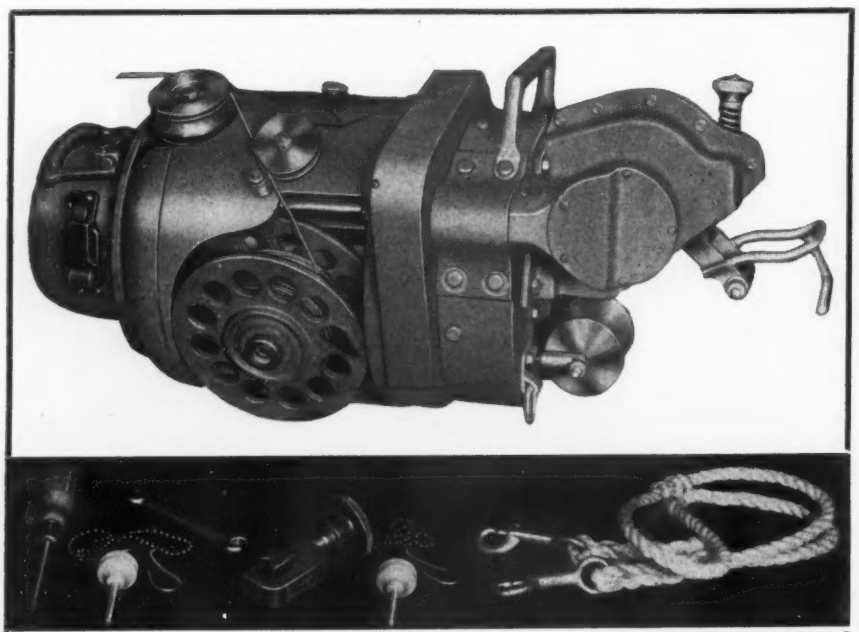
The same operations used on installing the terminal on plastic cables are used on strand-supported lead cables. If the cable is paper insulated a bag of desiccant is placed in each terminal.

In some companies the hourly splicing rate, with supervision, has reached $3.00 and due to many things the production has gone down. With the present method of splicing we reached the limit of production years ago and the only way now to increase production is through new methods, materials and tools.

We have found that through new methods and tools many large splices in the underground can be closed the same day the cable is opened, thus saving manhours, material and temporarily closing splices. But this is another story and time and space will not permit a complete review of all the splicing operations.

We hope this article, in some small way, will stimulate interest among the progressive companies, which in turn will reduce the splicing costs and improve the service—THE END

THE greatest truths are the simplest. So are the greatest men and women.



This Package Brings You Up to 67% Savings in Outside Plant Maintenance

When you specify spun cable to protect your outside plant investment, insist upon the Neale Model "D" Spinner. It comes to you complete, with all of the accessory tools to service and maintain the machine. And you can work toward a saving in outside plant protection of as much as 67 per cent . . . the experience of telephone companies in cable spinning, reported from all over the country.

Cable spinning is fast . . . economical . . . and practical . . . for new construction as well as maintenance. You get all the possible advantages of cable spinning when you equip your crews with Neale Cable Spinners. Both the Model "D," shown above, and the Model "B" One Man Cable Spinner are supplied to you complete in every detail . . . no extras to buy.

The Cable Spinning Company maintains an around-the-clock service in spare parts. For complete information on Cable Spinning tools, write or phone your jobber today.

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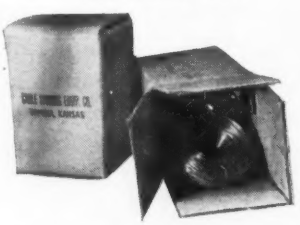

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TELEPHONE ENGINEER & MANAGEMENT'S

HANDBOOK DATA SHEETS

Prepared By

JOHN S. REED

Indexing System for Telephone Engineer's Handbook Data Sheets

Index 1-10.01
General-Indexing System for Handbook Data Sheets
Page 1, April 15, 1953

GENERAL HEADINGS: —

Telephone Engineer's Handbook Data Sheets are prepared under an indexing system which classifies various telephone plant subjects under the following headings:

1 — General
2 — Pole Line
3 — Wire Plant
4 — Cable Plant
5 — Station Equipment
6 — Central Office Equipment
7 — Tools
8 — Motor Vehicles
9 — Buildings

SUB-DIVISIONS:—POLE LINES

The material under each heading is subdivided into groups according to type of plant. Thus for pole lines, the subdivisions would be as follows:

10 — Pole Line Records and Distribution
30 — Pole Data
40 — Poles
50 — Pole Fixtures
70 — Pole Guys and Anchoring
80 — Pole Stepping

For wire plant, the planned subdivisions are as follows:

10 — Open Wire — Steel Conductors
15 — Open Wire — Copperweld Conductors
20 — Open Wires — Splicing and Terminating
25 — Open Wires — Transpositions
30 — Open Wire — Protection
40 — Drop Wire
60 — Drop Cable
70 — Service Cable
90 — Buried Wire

SUB-DIVISIONS:—CABLE PLANT

For cable plant, the subdivisions would be as follows:

10 — Cable Records and Distribution
30 — Cable Suspension Strand
40 — Aerial Cable — Lead Sheathed
45 — Aerial Cable — Plastic Sheathed
50 — Buried Cable — Armored Type
55 — Buried Cable — Plastic Sheathed
60 — Conduit for Underground Cable
80 — Cable Splicing — Lead Sheathed Cable
85 — Cable Splicing — Plastic Sheathed Cable

SUB-DIVISION BREAKDOWN

Each subdivision is divided into additional classes as follows:

01 — General (theory or description)
02 — Design
03 — Construction
04 — Installation
05 — Inspection
06 — Maintenance
07 — Testing and Fault Location
08 — Removal

For example, the index code for placing cable suspension strand would be 4-20.03. This system will enable the filing of the data sheets in a logical order and facilitate reference to any desired subject.

AUTHOR'S NOTE

The presentation of this new "Telephone Engineer & Management" feature department has long been one of TE&M's "pet" projects. For many years there has been a definite need for an editorial department that would present technical data and operating information in "Handbook" form. It is the hope of the author and the editors that the new "Handbook Data Sheets" will meet this need and be of true value to our readers. If you have a subject you would like covered in the "Handbook" section let us know . . .

TELEPHONE ENGINEER & MANAGEMENT'S

HANDBOOK DATA SHEETS

Prepared By
JOHN S. REED

Copperweld Communication Conductors for Open Wire Line

Copperweld is applicable for all types of communication lines from the most important grades of construction where safety and reliability are the main requisites, to the lightest types of lines where lowest initial cost is essential. It is used for multichannel carrier telephone and carrier telegraph lines, toll lines, important exchange lines, standard exchange lines, rural lines, forestry lines, telephone circuits in conjunction with transmission lines, and for special long span construction.

CONDUCTOR SIZES

Copperweld wire is composed of a steel core with a copper jacket intimately welded to it. The most commonly used conductor sizes for rural telephone lines are .104 inch and .080 inch. These wires have a tensile strength of approximately 150,000 pounds per square inch, developed primarily by cold working, starting from hot rolled rod which has a tensile strength of 50,000 pounds per square inch. For telephone conductors, the 40 percent conductivity material is the most popular, though 30 percent conductivity wire is available for special construction, such as river crossings, where strength is more important than conductivity.

Copperweld wire makes possible long span construction with the same degree of reliability required in short span construction, resulting in savings in poles and associated hardware and insulators. At the same time the copper jacket provides exceptionally good transmission, being about 40 per cent that of hard drawn copper.

D-C RESISTANCE OF SUBSCRIBER CIRCUITS

One of the design requirements for rural telephone lines relates to the d-c resistance of subscriber circuits. In modern dial systems, current for voice transmission is provided by a 48-volt d-c common battery. In order to obtain standard conditions which can be met by all manufacturers of dial switching equipment, a maximum of 1000 to 1200 ohms d-c resistance between the central office and the customer's premises is generally specified. Under this requirement, a 109 iron or steel wire loop has a maximum length of 15 miles, whereas a 104, 40% conductivity copperweld loop can be as much as 40 miles long. This extra length is an advantage in some of the sparsely settled areas where extremely long loops are common. Also, the open wire lines are often an extension from cable circuits and the cable circuits can use up much of the allowable resistance. For example, 6 miles of No. 22 ga. cable has about 1000 ohms loop resistance. If the actual cable run is 3 miles, the allowable length of open wire is cut in half.

TALKING QUALITY OF RURAL CIRCUITS

The talking quality of these rural circuits must be made as good as that of urban circuits and it should be possible for any rural subscriber to be connected to any other subscriber anywhere in the world. Since the talking properties of cable are not as good as open wire, the length of the cable run becomes an important factor in the wire used for the open wire portion of the circuit. Estimating charts which apply the Working Reference System to subscriber circuit design demonstrate the need for good conductance line wire on the long circuits and also show how open wire conductor selection may be applied to reduce the gauge size of the cable in new installations. For instance, on a 10 mile circuit requiring 2 miles of cable and 8 miles of open wire, the cable must be No. 19 gauge if used with standard steel wire. But, the smaller and more economical No. 26 gauge of cable can be used if 104, 40% conductivity Copperweld line wire is installed.

TELEPHONE ENGINEER & MANAGEMENT'S

HANDBOOK DATA SHEETS

Prepared By
JOHN S. REED

Stringing Data on .080 Inch High-Strength, 40% Conductivity Copperweld Communication Wire Used in Rural Line Construction

MECHANICAL DESIGN

Mechanical design is an important consideration in rural communication systems. Modern practice generally requires that open wire lines be built in accordance with a fairly strict interpretation of the National Electrical Safety Code. This code divides the country in 3 loading areas — heavy, medium and light. The maximum storm loading assumed for the heavy loading area is 1/2 inch ice, plus a 56 mile per hour wind; for medium loading, 1/4 inch ice, plus 56 mile wind; and for light loading, no ice and a 70 mile wind. The lines are generally designed so that, with the assumed storm loadings, the conductor is not stressed beyond 75 to 85 percent of its rated strength.

RESTRICTION OF NORMAL TENSION

In addition to limits on the stress in the conductor at maximum load, it is also modern practice to restrict normal tensions. In general, values of between 10 and 20 percent of the rated strength of the conductor are typical. For Copperweld wire, a value of 14 percent at 60°F. is being used. This limitation is very desirable to minimize the danger of vibration and the chafing or fatigue fracturing that could result. Low normal tensions not only increase the fatigue resistance of a conductor, but they also reduce the tendency of the conductor to vibrate.

STRINGING DATA ON .080 IN. 40% CONDUCTIVITY COPPERWELD COMMUNICATION WIRE

TABLE I indicates the physical and electrical properties of .080 inch high strength 40% conductivity Copperweld communication wire. Although this wire has a smaller diameter than the usual type of line wire employed in rural pressure leads, it is excellent for light line construction and provides good transmission. The conductor is light in weight, easy to handle, low in cost, and, at the same time, provides a strong conductor which will withstand storms.

TABLE I

Physical and Electrical Properties of .080 Inch High-Strength, 40% Conductivity Copperweld Communication Wire.

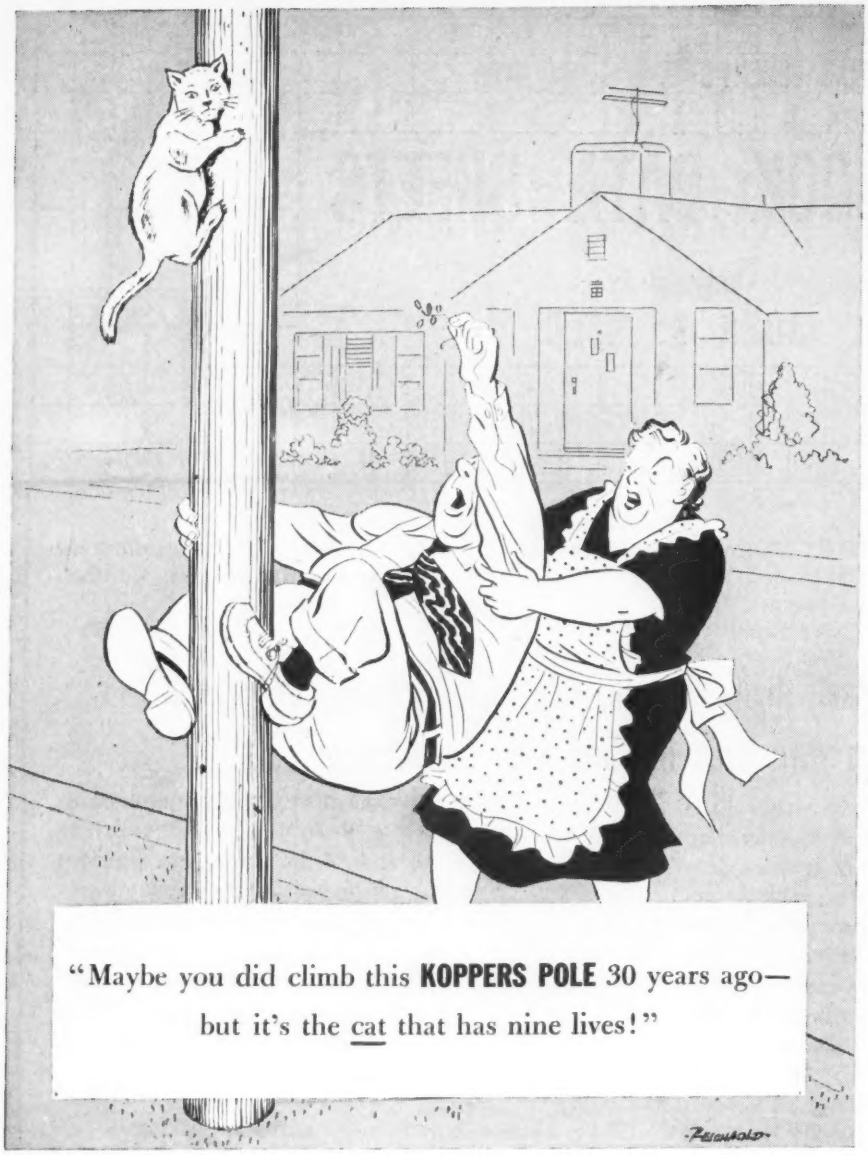
Rated Strength	770 lbs.
Weight, Lbs./1000 Ft.	17.76
Diameter, Inch	.080
Area, Square Inch	.005027
D.C. Resistance at 68°F.	4.133 ohms per 1000 ft.
Loop Miles of line for 1100 ohms resistance	25
Attenuation, wet weather, 12" Spacing db per loop mile (1000 cycles)	.219

TABLE II

Normal Sags For Stringing .080 Inch High-Strength, 40% Conductivity Copperweld Communication Wire

Span Length in Ft.	Normal Sag in Inches for Temperature in Degrees F. 0°F.	30°F.	60°F.	90°F.	120°F.
100	1¾	2	2½	3¼	4½
125	2½	3	3¾	5¼	6¾
150	3¾	4½	5½	7¼	9¾
175	5¼	6	7½	9¾	13
200	6¾	8	9¾	13	17
225	8½	10	12	16	20
*250	10¾	12	15	19	24
275		15	19	23	29
300		18	22	27	34
325		22	26	32	39
350		25	30	36	44
375		29	35	42	50
**400		33	40	47	56
425		38	45	52	62
450		43	50	58	68
475		48	56	65	75
500		53	62	71	82
525		59	68	78	90
550		65	75	85	98

*Maximum span length for heavy loading district.
**Maximum span length for light loading district.



• We can't blame the little woman for worrying. The Koppers Pole is in better shape than her husband.

Koppers Poles are famous for staying the same through the years. These durable poles reduce maintenance work and expense. They cut pole replacements, too.

Specify Koppers Full-Length Pressure-Creosoted Poles. It's the sure way to get long and trouble-free pole service. Write to us for quotations.

KOPPERS COMPANY, INC., DEPT. TEM-43, PITTSBURGH 19, PA.
WOOD PRESERVING DIVISION

KOPPERS **PRESSURE-CREOSOTED WOOD**

Finding Troubles Before They Happen

(Continued from page 35)

evidence that even in two offices of the same type, the same routines and routine frequencies were not required. That is, the application and use of preventive maintenance routines must be tailored by the Plant folks concerned to fit the needs of their own office. Aids for determining the requirements for preventive maintenance measures in any office were devised, and Plant people are now operating their offices on a "qualitative preventive maintenance" basis.

The application of the results of this study to central office maintenance programs across the country has improved customers' service. Furthermore, the qualitative approach has provided appreciable saving of effort in day-to-day preventive maintenance work. The changes from older methods of operation were accomplished without dislocation of central office people, and it is expected that further savings will accrue as qualitative methods are applied in the maintenance of other types of telephone plant.

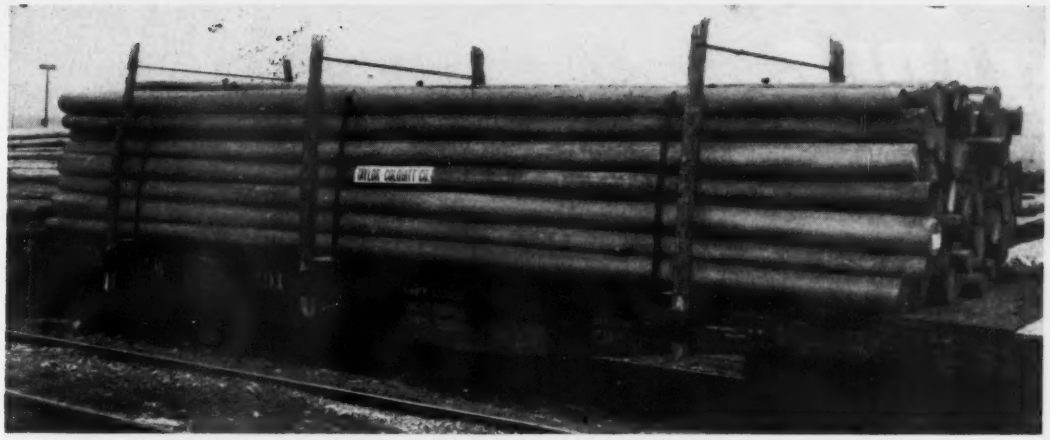
An Outside Job

ALMOST EVERYONE is familiar with the sight of telephone men working on the cables, poles, and wire which are collectively called outside plant. This plant accounts for somewhat more than half of the total investment in telephone property and contributes more than a quarter of the customer troubles. Periodic inspections are an important part of the maintenance program designed to keep it in both safe and serviceable condition.

Annually, supervisors inspect the outside plant to detect trouble conditions which may develop into hazards to public safety or may affect customer service. Knowledge, thus gained, of plant conditions is used to direct the more detailed inspection and repair work of telephone people skilled in the various phases of the job. In addition, every telephone man takes pride in noticing and correcting or reporting every trouble or potential trouble condition that he sees.

On some of the long distance cable

(Please turn to page 80)



Destined for a long life of service...

Here are poles destined for a long life of service to some telephone company. For they are Taylor-Colquitt treated Southern Pine . . . carefully selected . . . machine trimmed Vapor dried . . . and thoroughly treated to insure many years of use.

Throughout most of the States east of the Mississippi River, Taylor-Colquitt poles like these are regularly going into new and existing telephone lines. There these poles, like the millions which have preceded them during the past 27 years, will reflect in their rugged resistance to age and decay, the faithful care that Taylor-Colquitt has put into their production.

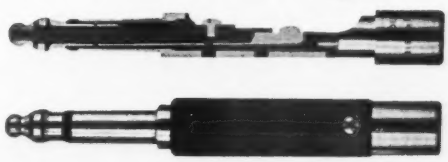
Taylor-Colquitt poles are distributed to independent telephone companies exclusively by Automatic Electric Sales Corporation, 1033 W. Van Buren St., Chicago 7, Illinois

TAYLOR - COLQUITT CO.
SPARTANBURG, SOUTH CAROLINA

PLANTS AT SPARTANBURG, SOUTH CAROLINA AND WILMINGTON, NORTH CAROLINA

Avoid Shorts and Trouble

With TFA Plugs



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Available as replacements for all popular two-and three conductor plugs.

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Every anchor man prefers the CHANCE 8-WAY

Not two... Not four...

but EIGHT blades

for better load distribution

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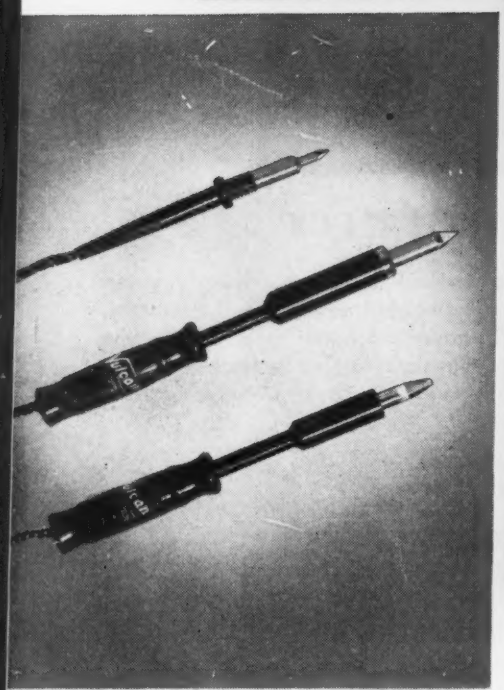

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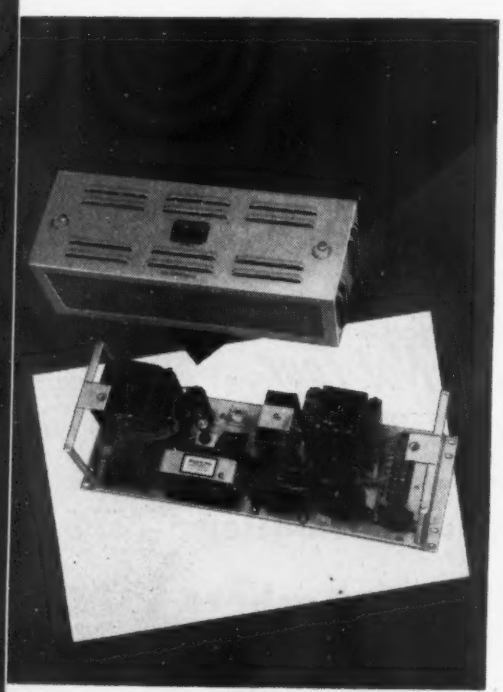

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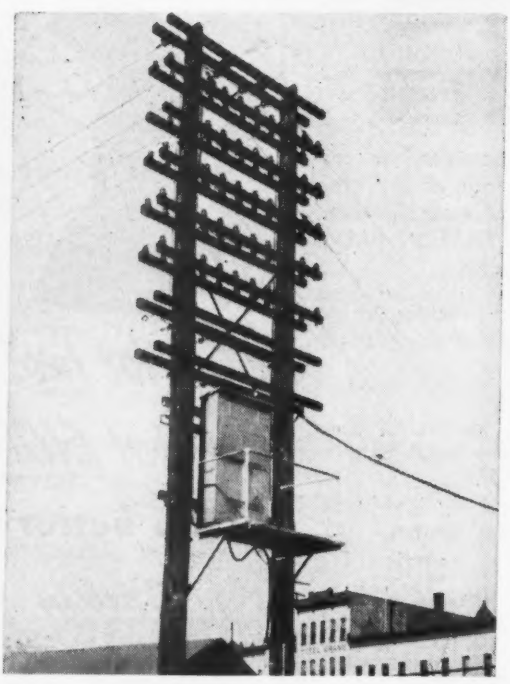

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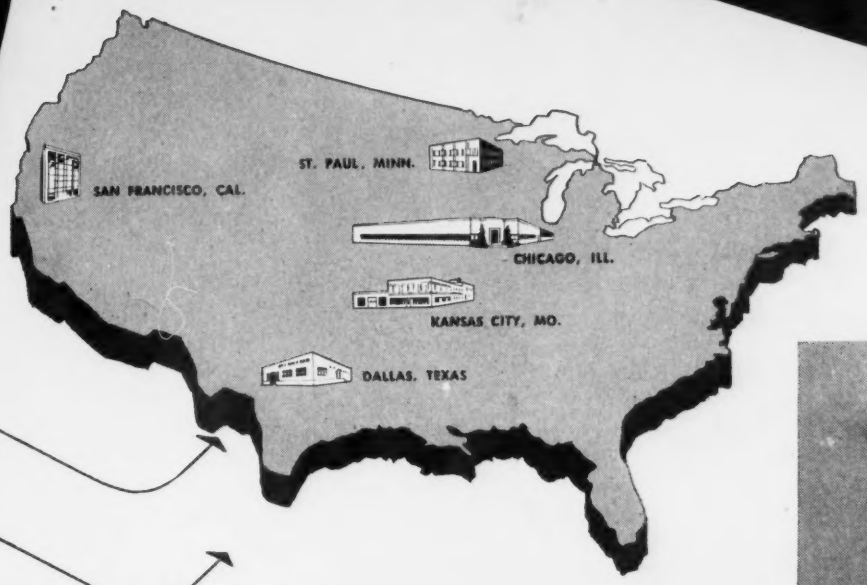
Time Proven—for 60 years Exide Batteries have been serving telephony! The Manchester positive plate with its button type construction provides long life . . use Exide Manchex for all your battery requirements. ELECTRIC STORAGE BATTERY CO.



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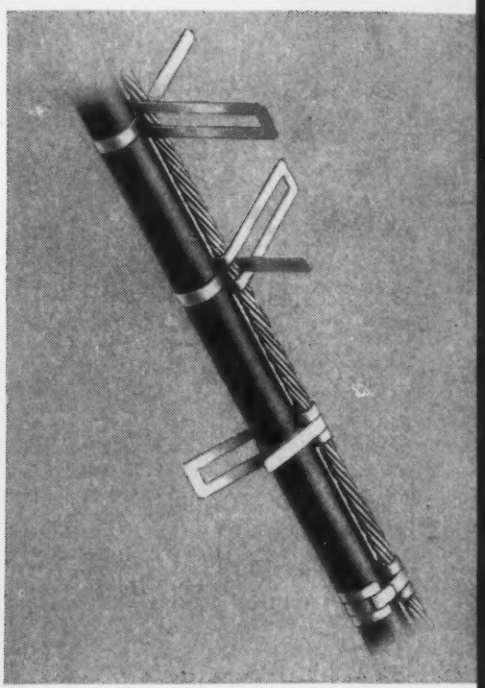
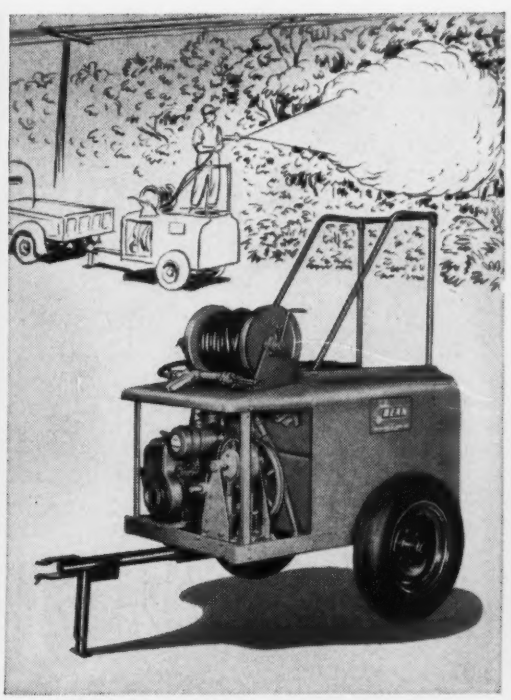


Easy on Cable— Many telephone companies prevent early cable discard by eliminating sheath cutting, creeping, and rusting with Reliable Zinc Cable Hangers. Hangers provide added protection against lightning. Made by RELIABLE ELECTRIC CO.

Sealed Against Trouble! Communication equipment manufacturers demand Kester Plastic Rosin-Core Solder, because it makes a perfect seal. Prevents high-resistance joints and intermittent open-and-close circuits. KESTER SOLDER COMPANY

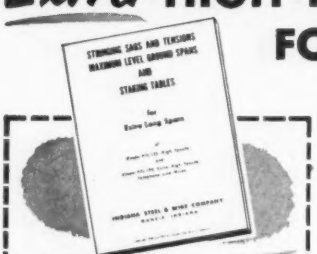


Use John Bean Versatile Power Sprayers for economical chemical control of weeds on telephone right-of-ways. Model shown above can be drawn by jeep, passenger car, light truck or tractor. JOHN BEAN DIVISION, Food Machinery and Chemical Corp.

The Expanding Plates and Spreader Arms of Everstick Anchors insure 100% safety and maximum holding power under excessive strain. Ribbed base plate allows anchor to be locked solidly on rod. Quickly installed. Made by EVERSTICK ANCHOR CO.

MEETING DEMANDS FOR *Longer* SPANS

Extra HIGH-TENSILE TELEPHONE WIRE FOR *extra* LONG SPANS!



Write FOR THIS INFORMATIVE BOOK!

Engineering data includes Stringing Sags and Tensions, Maximum Level Ground Spans and Staking Tables for Extra Long Spans of *Crapo* HTL-135 High-Tensile and *Crapo* HTL-190 Extra High-Tensile Line Wire. Ask for Data Book No. 300!

● Spans up to *600 feet* are possible with *Crapo* HTL-190 Extra High-Tensile Telephone Line Wires — latest achievement by the makers of *Crapo* HTL-85 and *Crapo* HTL-135 High-Tensile line wires.

Crapo HTL-190 has been developed specifically to meet the need of the telephone industry for *extra* long span construction of rural lines. It is designed especially for use where telephone circuits and power lines are to occupy the same pole structures. *Crapo* HTL-190 is applicable to the construction of open wire lines, where terrain and other conditions permit *extra* long spans, and for river crossings.

For maximum savings in the construction and maintenance of rural communication lines, specify the *Crapo* Telephone Line Wire which best fits your requirements!

Crapo Telephone Line Wire, Steel Strand, Tie Wire, Cable Lashing Wire and associated items are distributed by leading jobbers. Ask your Jobber representative for complete information!

* Trade Marks

INDIANA
STEEL AND WIRE CO., MUNCIE, IND.

(Continued from page 76)

routes which are vital to country-wide communication, inspections have become standard procedure. For instance, the cables connecting Boston, New York, Baltimore and Washington have all been placed underground for maximum protection. Nevertheless, a telephone man is assigned the task of riding in an automobile along the route of the cable to make sure that builders, road workers, or other construction people will not unknowingly damage the plant. In some of the more active areas, this ride is a daily affair, and in others it may occur once a week.

In the wider spaces of the West, where our cables go across country rather than along the highways, such patrols may be made from an airplane. For example, the buried cable between Shreveport, Dallas, and El Paso is one which is regularly patrolled by air to guard against unwitting damage by farmers or by pipeline, oil well, and similar construction workers.

Line Insulation Testing

ALTHOUGH inspections are effective and economical in keeping the outside plant in good condition, they cannot be completed often enough to prevent the development of serious troubles between the cycles. The largest source of such trouble is water or moisture getting inside the sheath of the cables and affecting the insulation between wires. During dry weather, breaks in the cable sheath have little or no effect on customer service, but during a rainstorm, water entering the cable may cause hundreds of troubles. The value of a means of rapidly detecting sheath breaks during dry weather was recognized many years ago, but little progress was made until the 'forties—when a new electronic line insulation test set and related techniques for its use were developed.

The success of line insulation testing as a preventive maintenance measure is attested to by its contribution to a 25 percent reduction in the number of customer reports of trouble caused by outside plant in 1952 as compared to 1947. This success is not due solely to the development of new equipment, but should be largely credited to the fine spirit which exists on the telephone team. Line insulation testing is most effectively per-

formed in the hours just before sunrise. At this time, air in the cable is usually at its lowest temperature, and has contracted and drawn additional air and its contained moisture through any break in the cable sheath. This lowers insulation resistance and permits the test set to recognize a potential trouble. The record of failures encountered by the central office man who makes the test is passed along to a tester or deskman who identifies the cable involved and analyzes all indications to discern what troubles are most likely to be found. He in turn dispatches a cable repairman to locate and repair the trouble. Since all of this work must be completed before the sun has dried the moisture out of the cable, the effectiveness of the method can only be measured in terms of teamwork displayed.

A more recent development in this field is an automatic line insulation test set capable of scanning 12,000 lines per hour and recording encountered troubles on a teletypewriter in the test bureau. The set should further improve performance, and will relieve central office people of the task of making manual tests before sunrise.

Air as a Preventive Tool

THE TRUNK cables connecting and carrying the conversation between various central office buildings and cities are a vital link in communications. As such, they demand especially high-grade preventive maintenance treatment.

Some years ago, a very successful measure was developed. These cables are filled with dry nitrogen gas held at a pressure of 6 to 10 pounds, pumped up, in effect, just as we pump up a tire on our car. Pressure-sensitive switches are provided at various points along the cable run and, should a sheath break develop, the drop in gas pressure will close a switch to give an alarm at some ceneral point, thus drawing the attention of maintenance people to the failure. In addition, the gradual escape of gas through a small break will prevent moisture from entering the cable to interfere with service, until repairs can be made.

Although this system is the best so far devised for maintaining cable plant in good condition, it is too costly for general use on the distribution cables serving customers. More recently, a trial "continuous flow gas pressure system" was installed on the distribution cables at Caldwell, New Jersey. At the central office, an air compressor and dehydrator supply dry compressed air at 6 to 9 pounds' pressure to the cables leaving the building. Before entering the cables, this air is passed through gas flow meters similar to those which measure the gas used for cooking, so that maintenance people can tell how much air is entering each cable. Although all ends of the cable have been sealed with air-tight plugs, some air is always flowing into the cables because of minute leaks, and a normal weekly consumption through the meter for each cable was established. Central office men, keeping an eye on the meters each week for excessive air flow, can readily observe when a break occurs in a cable, and can dispatch a cable repairman to fix it before service is affected. And again we have the advantage that, in most

(Please turn to page 82)

You can string Amertel twice the distance possible with regular BB wire! Amertel is **2-1/2 times stronger.** You can span rivers instead of building expensive pilings. You can cut across curves instead of following roads. Experience shows Amertel 135 cuts pole, hardware, installation, and maintenance costs in half. Write or call our nearest warehouse now for prices.

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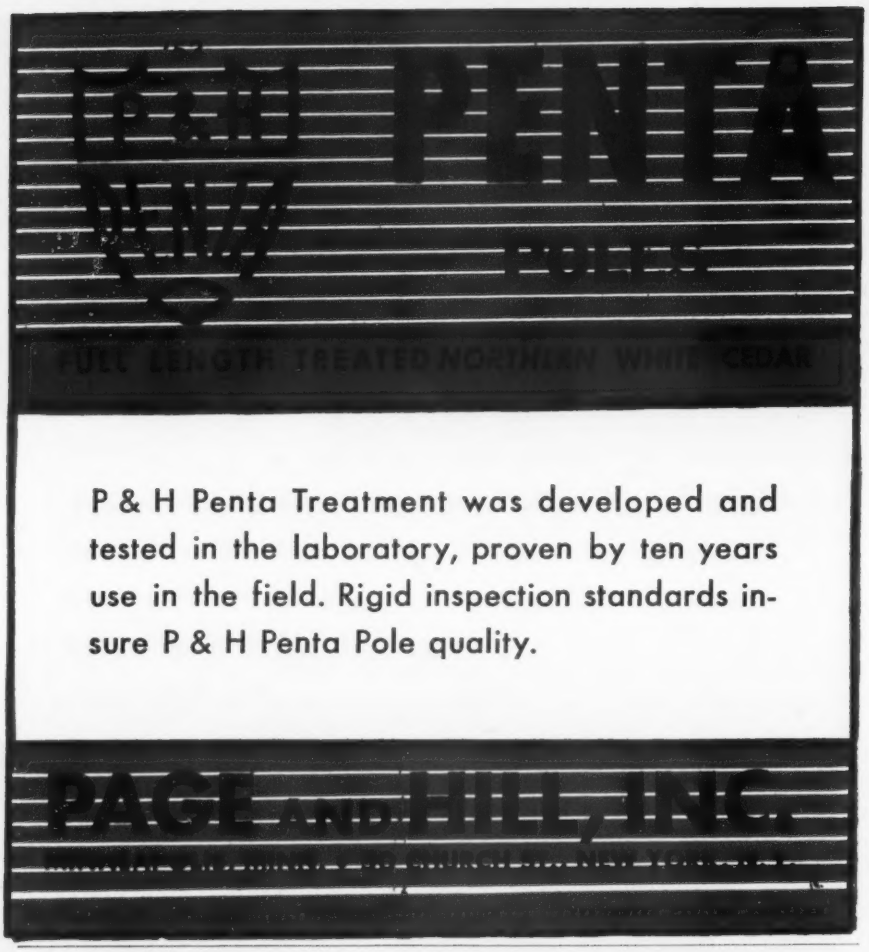
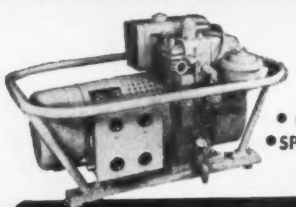

FULL LENGTH TREATED NORTHERN WHITE CEDAR
P & H Penta Treatment was developed and tested in the laboratory, proven by ten years use in the field. Rigid inspection standards insure P & H Penta Pole quality.
PAGE AND HILL, INC.



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Portable POWER
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KATOLIGHT has portable dolleys and carrying brackets available, making Katolight Plants easily available to plug in time-saving equipment such as light saws, drills, man-hole heaters, and other electrical tools.

Gasoline models from 350 Watt through 42 KVA. DC Models available 500 watt through 15 KW in standard voltages for continuous and standby service.

Also Multi-frequency Ringing Power Equipment

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NATCO
CLAY CONDUIT
The proved and standard Protection for Underground Telephone Cables.
Cheapest in the long run.
Highest quality and a full line of shapes.
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327 FIFTH AVE., PITTSBURGH 22, PA.

(Continued from page 81)

sheath breaks, escaping air will prevent moisture from entering to affect the insulation and thus protect customers' service even under bad weather conditions.

This continuous flow system of cable maintenance has been effective in aiding to provide maximum customer freedom from troubles due to sheath breaks. However, costs are still too high to make it economically attractive except under the unusual circumstances encountered in such places as the island of Nantucket, Massachusetts, where customers are 30 miles at sea, or Brownsville, Texas, where cable beetles drill holes in the sheath just as termites might damage a house.

Operation Snow Shovel Typifies the Future

THE ACTIVITIES so far discussed have been in the realm of the everyday problem. Sometimes preventive measures must be developed on the spur of the moment to meet an unusual situation.

During March of 1952, snowfall of unprecedented heights developed in areas in the Sierra Nevada Mountains, where there is a cross-country long-distance open-wire line. In fact, in some places, the snow was as much as ten feet over the top of the lines. Knowing that the snow would pack tightly as it melted, and thus place strain on both poles and wire, which would eventually demolish the line, a hardy telephone team recognized an unusual condition and organized "Operation Snow Shovel." All of the snow to a level just below the wires was shoveled out to form a trench twelve to fourteen feet wide and as much as sixteen feet deep along the parts of the line that were endangered..

With nation-wide operator toll dialing an accomplished fact in many of our cities, and with Englewood, New Jersey, customers now dialing directly such points as San Francisco, the need for maintaining equipment in trouble-free condition becomes more vital daily. There is no doubt that a team which can devise the routine measures discussed in this article, and likewise tackle an "Operation Snow Shovel" on the spur of the moment, can also continue to improve service and reduce costs to meet the needs of the business.—THE END.

Modern Circuit Testing Methods

(Continued from page 55)

line together as indicated in *Figure* 4. This would result in the ground fault appearing to be on both ends of the opened wire, instead of being on one end or the other of the wire, according to the direction of the fault.

Both sides of the line are opened at a convenient point, such as the terminal at the open wire junction to the cable, or at a junction pole for spurs from the main line, where a ground connection can be easily obtained, as at the terminal housing or a down guy as shown in *Figure* 5. (If no ground connection is available, a temporarily driven ground rod with No. 14 ground wire spliced to the tail may be used for the ground lead.) One clip is connected to ground and the other clip to one or the other line wire as required to get the fault reading.

(To Be Continued In The May TELEPHONE ENGINEER & MANAGEMENT.)

Dial System Planned For Clarinda, Ia.

MANAGER A. L. Kelley took his dial system story direct to stockholders of the Clarinda (Ia.) Telephone Co., and 82 stockholders listened. Then without argument, they promptly approved Kelley's dial conversion program.

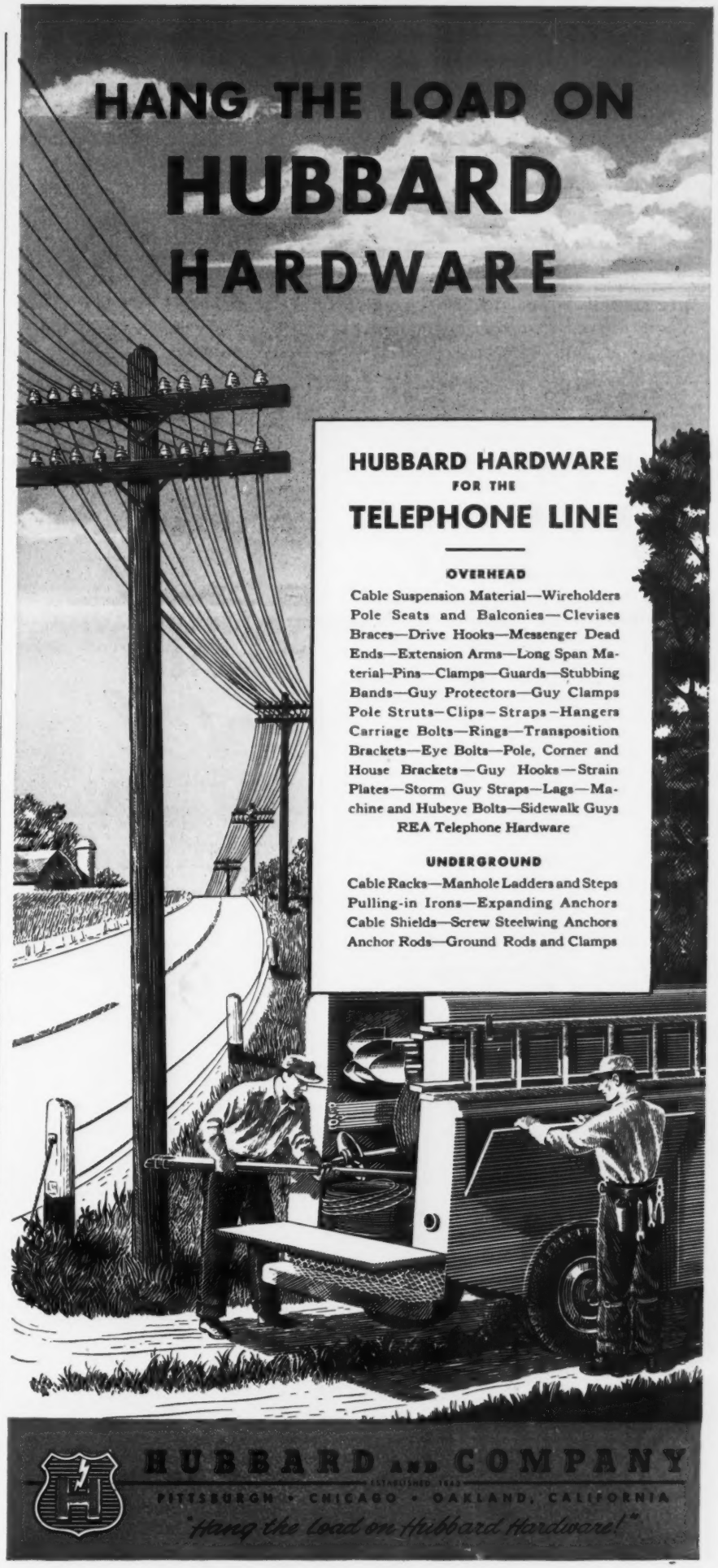
The new dial system will give Clarinda and vicinity a modern telephone system, and will improve service in town and rural areas.

The change-over comes at a significant historical date for the telephone company and Clarinda. 50 years ago the company started, serving rural patrons only. 100 years ago the first lots were sold in Clarinda.

In 1903 the company listed 46 telephones in Clarinda. 66 were listed in the 1904 directory. Today the company serves over 2500 telephones.

REA Receives Report On Rural Radio Trunk Link

AS THE RESULT of practical operating experience obtained by Rural Electrification Administration operation of a subscriber radio trunk line near Fredericksburg, Va., acceptable radio equipment for use in either subscriber trunks or central office



trunks, will soon be available, an engineering survey by the Hopkins Engineering Co., Inc., indicates.

This equipment will be properly packaged, thus requiring only platform mounting, an electric service connection, equipment ground, and a telephone pair connection at the installation site, the report states.

The Hopkins report is devoted almost entirely to technical considerations, and it is understood that a broader survey, covering economic, commercial, and operating matters, will be issued by REA at a later date.

The REA radio system was installed to connect 10 subscribers in a remote area at Alsop, Va., with the central office of the Fredericksburg & Wilderness Telephone Co., an REA borrower. The Hopkins report said that because of terrain considerations and available lines, the area might have been more economically served by open wire pole lines. It said the test area was chosen because of its proximity to REA's Wash. office

GENERAL CABLE

Now—STRONGER
No. 18
Neotel
DROP WIRE

Costs Less-Lasts Longer

The No. 18 Copperweld conductors of this Neotel Drop Wire provide 20% greater strength than No. 17 of other types—at a lower cost! Their 400-lb. breaking point enables them to bear heavier ice loading—to take all kinds of punishment longer without maintenance. Neotel's tough Neoprene jacket resists weather and wear, sun and oil. Field-tested, proved. Write or call our nearest warehouse for prices on No. 18 Neotel Parallel Drop Wire today! It costs you less now—less in the long run.

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Nebraska Pioneers Report Excellent Progress In 1952

A FINE YEAR of progress was recorded in the mid-year report of the Frank H. Woods Chapter of the Independent Telephone Pioneer Association. In issuing this report to the Chapter's officers and committee chairmen, President Bruce Sievers said that membership in the Chapter had reached a new high of 483, a gain of 13 since June 30, and that several successful social events had been held with fine attendance. He praised the work of the various committees.

So far the Chapter has held a men's summer fishing party and a men's hunting stag as outdoor events, and a women's party and a general Chapter get-together and hobby show. Events scheduled in the next few months are the annual ladies banquet, a Pioneer luncheon at the Nebraska Telephone Convention, the Chapter's annual banquet on May 16 and a men's spring fishing party.

A newly formed committee on hobbies was launched this year with Past President Joe Hartley as Chairman. This committee has been very active and has succeeded in developing a great deal of interest among members. Several displays of hobbies have been made and a number of classes have been held to encourage members to form hobbies and instruct them in the pursuit of these hobbies. So far hobby classes concerning the following activities have been held: huck toweling, gift wrapping, candy making, decorative glow candles and cake decorating.

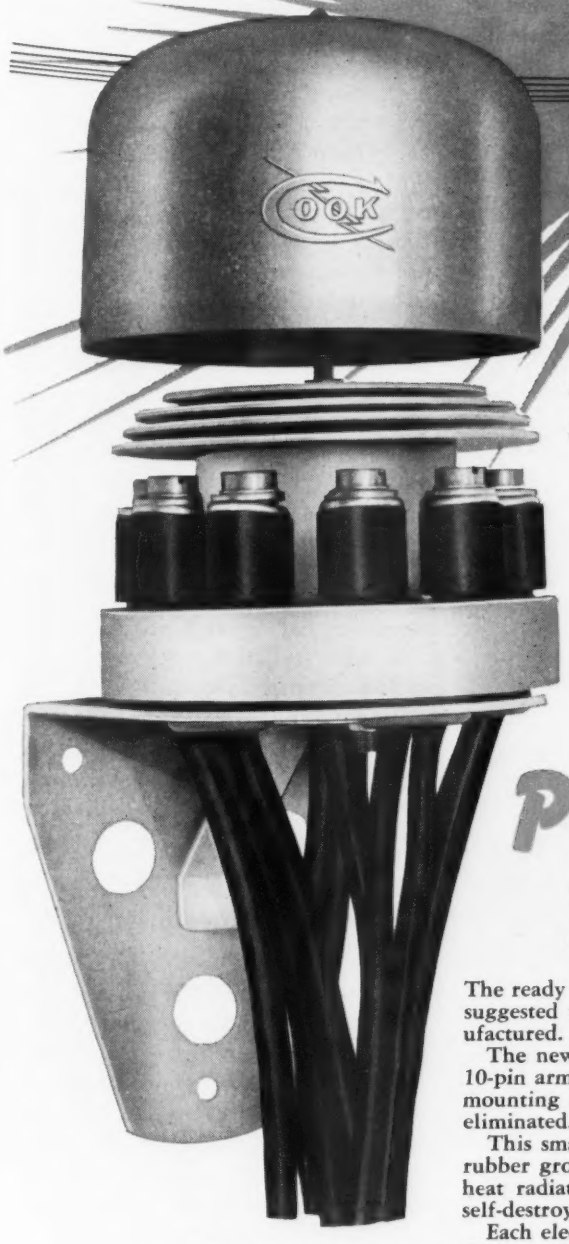
The Chapter is now planning to hold an annual bazaar in order that products of members' hobbies may be displayed or sold. Also at the telephone convention the Hobby Committee will have a hobby show and a display of antique telephones and equipment.

General Tel. of Kentucky Installs 60,000th Telephone

GENERAL TELEPHONE Co. of Kentucky recently installed its 60,000th telephone in the home of Mrs. R. B. Razor at Salt Lick, Bath County, Ky. This telephone as well as the remainder of the Salt Lick community is served by the new Owingsville dial exchange.

The installation marks a tremen-

POWER CROSS PROTECTION *is now* "GANGED UP"



Catalog No. 501-50

WITH THE *New* COOK 5 CIRCUIT POWER CROSS PROTECTOR

The ready acceptance of the new Cook single pair Hy-Cap Power Cross Protector has suggested the development of a 5-pair Hy-Cap Protector which is now being manufactured.

The new protector provides a single assembly for 5 circuits to be mounted on a 10-pin arm requiring only a single ground wire. It is easy to install with only three mounting screws and five pigtail connections. Pole gaining and through bolts are eliminated. Pigtails are factory wired to the protector.

This small size unit is weather proofed with an aluminum cover and sealed with rubber grommets. It is designed to provide an extended arcing period by means of heat radiation fins and to prevent carbon breakdown by means of a light gauge self-destroying cover.

Each electrode is equipped with a fusible element which melts and further reduces the impedance of the fault current path when the power cross continues over an extended period.

Ideal for economical joint occupancy open wire installations.

COOK ELECTRIC Company

2700 Southport Ave. Chicago 14, Illinois

dous increase in the services provided by the company in its Kentucky operation. During the past eight years the increase in telephones has been 22,042 stations. During the past five years the increase has amounted to 17,130 stations, a phenomenal increase when consideration is given to the fact that it has been accomplished in the face of critical material shortages, government controls, and constantly rising cost.

The increase is a positive demonstration of the desire on the part of the management of the General Telephone Co. of Kentucky to constantly increase and improve its services to the people of Kentucky in the territory that it serves. Further proof of this forward looking policy is the fact that since the cessation of hostilities of World War II the company has converted 57% of its total stations from manual to dial operation in order that its subscribers might have the most modern and efficient service possible.

THE TONGUE, being in a wet place, is likely to slip when going fast. — *The Coal-Getter.*

During the same five-year period the number of "held applications" for service has decreased from 5,424 to 2,568 in spite of the constantly increasing demand for telephone service in all exchanges in the state.

In order to provide service to these additional telephones it has been necessary for the company to engage in many large scale construction projects and their plans for the future include many more such projects as well as conversion to dial operation of more of the exchanges that are not now so equipped.

In order to anticipate the needs of the various communities which are provided service by this system continual commercial surveys are in progress which provide information with which to properly engineer facilities far in advance of the actual needs. This is necessary in order that material and equipment may be ordered and construction and installation plans made sufficiently in advance so that facilities will be available when required.

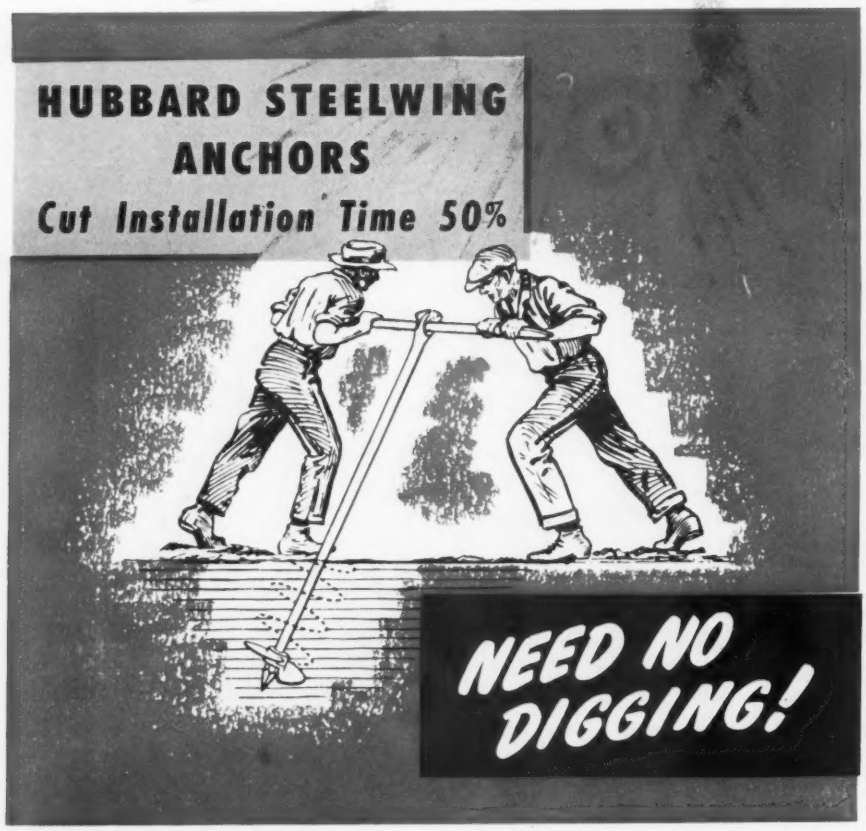
The company serves these 60,000 stations through 23 exchanges and maintains District Offices at Ashland, Morehead, Lancaster and Versailles. Its general offices are at Lexington, Ky.

General Tel. Elects Two Assistant Comptrollers

THE BOARD of Directors of General Telephone Corp. elected two assistant comptrollers at the regular board meeting on March 5, Donald C. Power president, announced. Selected for the new offices were G. Robert Howard and Anthony A. Pacifico, who will be assisting Raymond E. Dolar, General Telephone Corp. Comptroller. Both assistants will continue their assignments at the corporation's headquarters in New York.

Mr. Howard graduated from Syracuse University with a Bachelor of Science degree in Business Administration in 1935. Prior to his association with General Telephone System, Mr. Howard worked with Remington Rand, Inc., Crucible Steel Co. of America, Republic Industries, and as

(Please turn to page 88)



Two of your men can install a Steelwing by hand in one hour—just 50% of the time they'd take to install an ordinary anchor. Steelwing requires **no digging!** Your men simply turn it into the ground with a crowbar, like a corkscrew. Telephone men find Steelwing holds light guying securely in average soil, its one-piece construction makes recovery easy. Write or call our nearest warehouse for prices. Six sizes: 4 to 10" wing diam.

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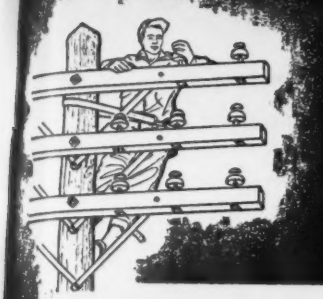
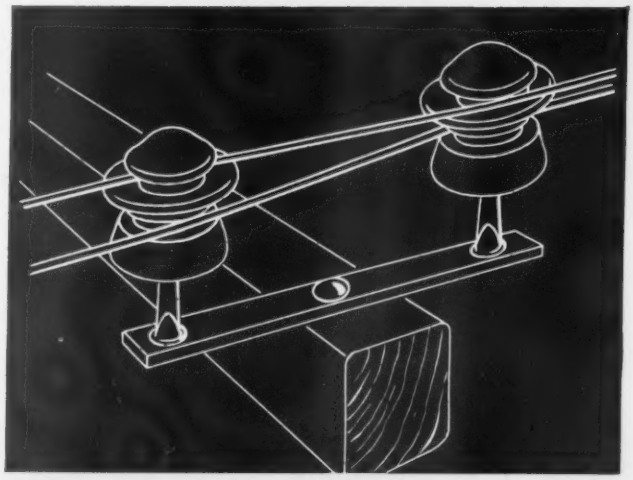
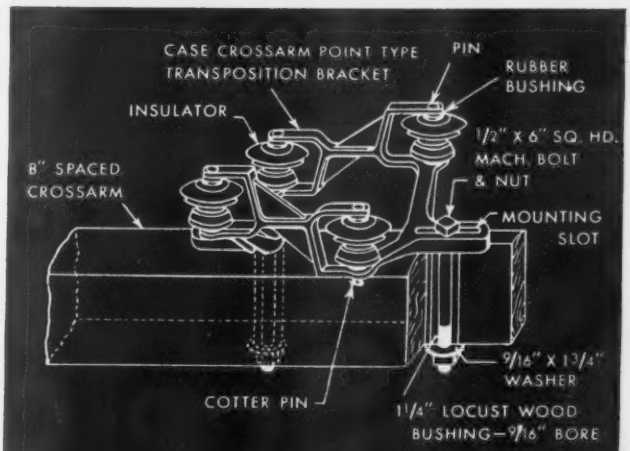


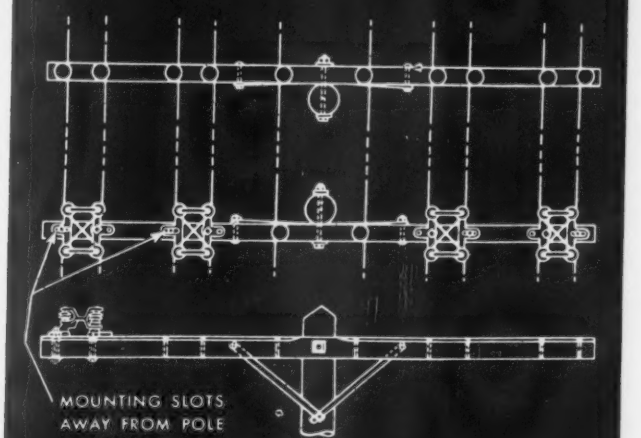
LINE CONSTRUCTION BLUEPRINTS

ITEMS SOME COMPANIES ARE USING TO MAKE LINE CONSTRUCTION WORK EASIER



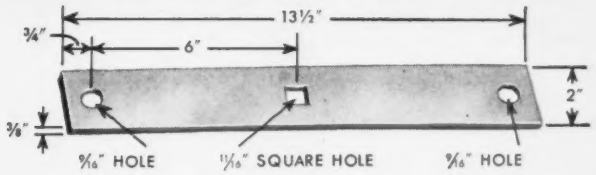


CROSSARM POINT TYPE
INSTALLATION METHOD



TYPICAL INSTALLATION
STRAIGHT LINE CONSTRUCTION

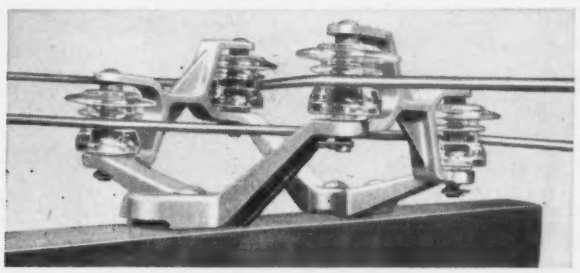
L-M TYPE "B" TANDEM TRANSPOSITION BRACKET



Used with transposition insulators for telephone line transpositions. Recommended for straight sections or at corners where pull is less than 15 feet. Heavy ⅜" x 2" steel, hot dip galvanized. REA-approved.

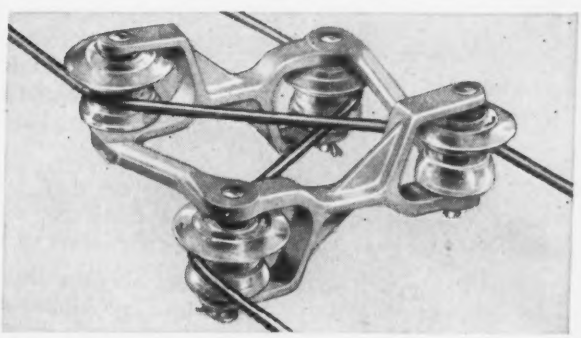
L-M CASE Roller Type TRANSPOSITION BRACKETS

Crossarm Point Type



Case Brackets equalize tension, balance lines, eliminate tie wires. Insulators *roll* easily as wire is tensioned—cutting installation time. Special rubber bushings set in insulators maintain continuity of service if insulators break. Available in crossarm and span point types, both of aluminum alloy. Weight—less than 4 pounds.

Span Point Type



Do you have a line construction problem?

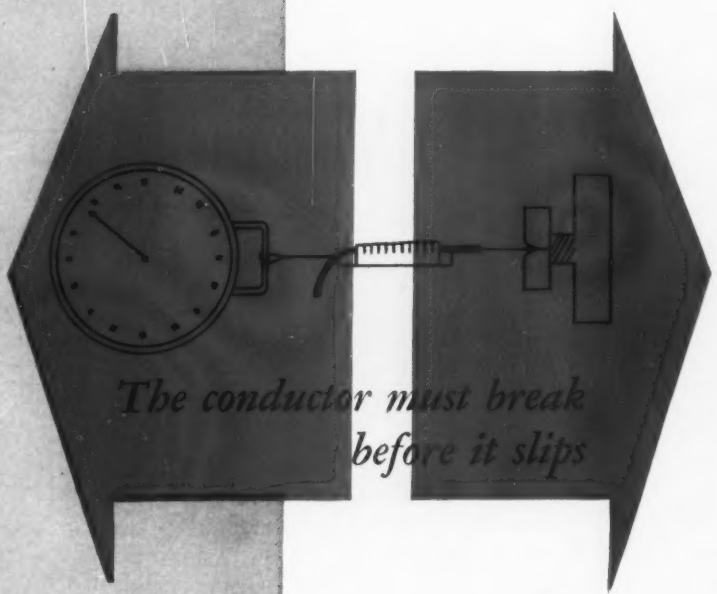
These are just a few of thousands of L-M line construction specialties. If you have a line construction problem, let us know. We may have standard or special items in stock that will solve it. Ask the North Electric or Kellogg representative or the L-M Field Engineer. Line Material Company, Milwaukee 1, Wis. (a McGraw Electric Company Division).

LINE MATERIAL *Line Construction Materials*

119-R

ALPHADUCT

P clamp adhesion test



P clamps are the most widely used method of attaching drop wire to buildings. Lest you may worry about a P clamp causing slipping of the insulation or jacket on Alphaduct Neoprene Jacketed Drop Wire — read about this Alphaduct service test. This test is made daily.

A sample of Alphaduct wire is inserted in a P clamp with 12 inches of the wire projecting from the top of the clamp. The bail of the clamp is then inserted in the upper jaws of a tensile testing machine, and the end of the wire is stripped free of jacket and insulation and inserted in the other end of the machine.

The jaws of the machine are then gradually separated until the conductor breaks. The conductor must break before there is ANY slipping of either the jacket or the insulation.

Don't have any worries about a little old P clamp hurting ALPHADUCT drop wire. Try Alphaduct. It's dated by a color coded thread so you can see for yourself how long it lasts, how much money it saves.

ALPHADUCT WIRE AND CABLE COMPANY • MILLTOWN, NEW JERSEY
NATIONAL DISTRIBUTORS • LEICH SALES CORPORATION, CHICAGO, ILLINOIS
REGIONAL DISTRIBUTORS • PANKEY SUPPLY CO., CHARLOTTESVILLE, VA.
THE LINDSAY TELEPHONE SUPPLY CO., CLEVELAND, OHIO

(Continued from page 86)

a member of the comptroller's staff of Standard Brands, Inc. in the capacity of methods and procedures adviser. Just before joining General Telephone, Mr. Howard was working with Ebasco Services, a consulting corporation, where he was assigned to planning of work simplification, long-range space planning and various standardization procedures.

Mr. Pacifico attended the New York University School of Commerce, Accounts and Finance, and prior to joining the General Telephone System had worked for the American Tobacco Co. as an accountant, the United States Treasury as an internal revenue agent, the Federal Communications Commission as head accountant, Press Wireless, Inc., and the Co-operative for American Remittances to Europe, both of the latter organizations as comptroller. His most recent job, prior to his appointment at General Telephone, was as assistant comptroller for RCA Communications, Inc.

Mr. Power pointed out that the new appointments resulted from the rapidly developing expansion program of the General Telephone System which made it necessary for the addition of qualified management personnel so that the System's over-all planning and operating problems could be effectively undertaken.

George L. Smith Dies: Owned Newport, Mich. Exchange

GEORGE LUDWIG SMITH, 75, owner of the Newport (Mich.) Telephone Co., died of pneumonia on Feb. 22.

Mr. Smith was born Jan. 20, 1878, at Newport. He attended school at Monroe, Mich., and at the age of 21 went to Decatur, Ala., where he worked for the Independent Telephone Co. for two years. He then moved to Birmingham, Ala., as an electrical contractor.

In 1916 he returned to Newport and for two years worked for the Newport Telephone Co. In 1918 he purchased the company and continued with electrical contracting and telephone maintenance. About 10 years ago he gave up the contracting but continued with the business and maintenance.

He was a member of Trinity Episcopal Men's Club and had served the church as vestryman. A past noble grand of Monroe Lodge, IOOF, of

which he had been a member for 30 years, he also was a member of the IOOF Encampment. He held charter membership in the Newport volunteer fire department.

He is survived by his widow, a son, Norman; a daughter, Mrs. Erwin Cousino; five half brothers, Conrad, Walter and Wilson Smith of Monroe, Charles of Newport and John of Maybee; four half sisters, Mrs. Frank Leach and Mrs. Bert Garlick of Van Dyke, and Mrs. Thomas Zimmerman and Mrs. Edna Peters of Monroe.

James N. Cox, 77 Dies at Cookeville, Tenn.

JAMES NATHANIEL COX, 77, prominent Independent telephone company executive, died Mar 13 at a nursing home in Cookeville, Tenn., following an illness of several months.

A native of Gainesboro, Tenn., he was the son of the late Robert Alexander and Nan Draper Cox.

He was a graduate of the University of Tennessee and served as president of the University of Tennessee Alumni Association from 1936 to 1938 and also for several years on the executive committee.

He went into the telephone business in 1903 with the organization of the Gainesboro Telephone Co. and served that organization as vice-president and general manager until it was bought by the Southern Continental Telephone Co., which serves several Middle Tennessee and some Kentucky counties.

He was first president of the Tennesse Independent Telephone Association and was a member of the United States Independent Telephone Association and the Independent Telephone Pioneer Association.

He was a trustee of Dixie College, which was located in Cookeville on the site now occupied by Tennessee Tech. He was mayor of Cookeville from 1941 to 1944 and formerly served as editor of the Putnam County Herald.

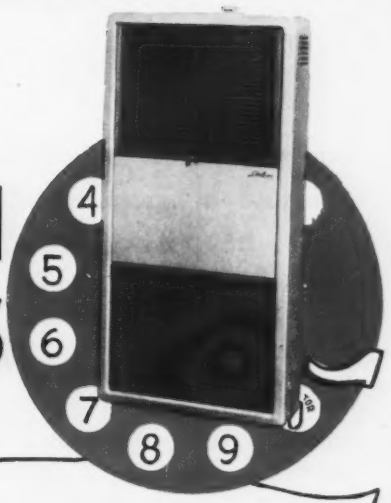
Mr. Cox is survived by his widow, Mrs. Mary Young Cox, to whom he was married 56 years ago. Other survivors include three daughters, Mrs. Sam H. Coile, Washington; Mrs. Henry F. Martin, Mobile; Mrs. Mary Cox Robinson, Cookeville; four sons, Charles H. Cox, Cookeville; Robert A. Cox, Mobile, James N. Cox, Jr., Cookeville; William B. Cox, of Fayette, Ala., and 13 grandchildren.

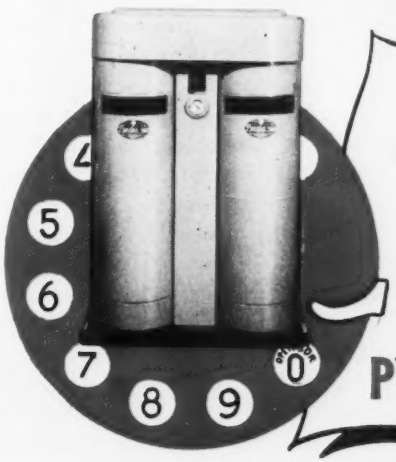
Here's Dependable, Economical

heat

for your

Non-attended DIAL OFFICES





a STEWART-WARNER "Safety Sealed" Wall Heater plus PYROFAX Bottled Gas

● **STEWART-WARNER "SAFETY SEALED" WALL HEATER** is the *only* small unit heater that seals the flame and flue *completely* from the dial office interior. Its clean, dry heat eliminates damage to equipment by moisture or dirt. Thermostatically controlled to maintain 35° to 40° temperature for normal operation. Room can be brought to 60° to 70° quickly—either by heater control or use of remote connection to dial system. Easily installed in *any* type exterior wall. No chimney or duct work needed. All combustion products immediately vented outside through small exterior wall vent.

● **PYROFAX SUPERIOR BOTTLED GAS** is a product of Union Carbide and Carbon Corporation—one of the world's leading chemical companies. Its high quality is maintained by a series of exacting tests to assure users pure gas, free of moisture and other impurities. Clean blue flame burns without soot or odor—there is no waste. No minimum monthly charges. Quick, easy, installation with automatic changeover device, designed to turn on gas from reserve cylinder when cylinder in use becomes empty.

Service on both wall units and fuel supplied by PYROFAX Gas Distributors in 30 states east of the Rockies. Write for complete information and name of nearest authorized distributor.

Pyrofax TRADE MARK LP GAS THE MODERN FUEL

Superior BOTTLED GAS Service

PYROFAX GAS COMPANY

A Division of Union Carbide and Carbon Corporation

30 East 42nd Street UCC New York 17, N. Y. Dept. T. E.

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United Utilities Begins Process of Acquiring Investors' Telephone Co.

United Utilities to acquire Investors' Telephone Co. through purchase of majority of common stock. Purchase will add 86,672 stations to United's 240,262 telephones.

STEADILY-progressing group of Independent telephone companies, the third largest system of Independent operating companies, United Utilities, Inc., began a process last month to acquire a smaller but substantial Independent group, the Investors Telephone Co., by purchase of a majority interest, 66.69% of the latter's common stock.

The acquisition, when consummated, would add to the Investors' 86,672 stations, as of the end of 1952, to the 240,262 telephones served by United Utilities for a combined total of almost 327,000. Last year, United Utilities had gross operating revenues before taxes of $15,053,867, and Investors had $5,183,882.

This became known formally with the filing March 10 by United Utilities of a registration statement, for the issuance of 319,122 shares of common stock to be sold to its present shareholders, with the Securities & Exchange Commission (SEC).

The offering proposed in the United Utilities registration is the issuance of 319,122 shares of common stock, with $10 par value, with the present United stockholders to get first opportunity to buy at the ratio of one new share for each 2½ shares held. Plans call for mailing of rights to the United Utilities stockholders April 1, with an expiration date for subscriptions by April 14. Then, unsubscribed shares would be offered publicly.

The sale of the stock would produce approximately $5,100,000, it is estimated on the basis of the current price of United common stock of about 16. United would buy with this money 174,000 shares of the Investors Telephone Co.'s stock at a tentative price of $30 a share.

Upon completion of the acquisition of Investors' stock, the present intention and plan of United, the registration statement declared, is to combine Investors' six wholly-owned telephone subsidiaries in eight states with those operating companies of United by merger, purchase of assets, or other methods, subject to approvals of stockholders of both companies and the regulatory authorities. The registration statement was signed by United Utilities President Alden L. Hart, C. A. Scupin, first vice president and treasurer, and three United Directors, R. C. Kemper, Gustav Hirsch, and A. Z. Patterson.

All net proceeds from the stock offering are to be applied to the acquisition, the United's registration statement cited. Any additional funds for the purchase of the majority stock of Investors which may be necessary will be obtained initially from a bank loan or from sale of additional debentures of United.

Of the 174,000 shares of the Investors Telephone Co., the registration statement cited, 60,177 shares are proposed to be sold by a corporation in which Pierre F. Goodrich, a director and vice president of Investors, is a principal stockholder; 30,008 shares by John F. Baker, a director and vice president of Investors, and members of his family; 30,004 shares by a member of the immediate family of William J. Walsh, president and director of Investors; and 27,760 shares by a member of the immediate family of Edwin J. Smail, director and secretary of Investors. The remaining shares are proposed to be sold by some 60 other stockholders of Investors.

Price For Purchase Arrived At By Negotiation

THE STATEMENT filed with the SEC declared the price for the purchase of the stock was "arrived

(Please turn to page 92)

Construction Ma

With the Double
and America's

Gu
Lea

the new **cane** *seat is cooler - cleaner - more comfortable...*

sturgis SC-240

Literally "by request"—this new operator's chair retains all the posture advantages for which Sturgis is famed and adds the cool, clean comfort of a *cane* seat. The posture-curved, well-cushioned back rest is covered in genuine leather.

The exclusive Sturgis "Follow-Flex" feature automatically adjusts to the operator's every movement, supports her restfully all the time, discourages fatigue, keeps her at top efficiency.

Other new and welcome features include a plastic-coated steel foot ring which retains its color and a handy purse holder, available on request. Six seat heights, all adjustable.

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Materials and Supplies . . .

Guarantee of Stromberg-Carlson Leading Manufacturers . . .

reversible • weatherproof

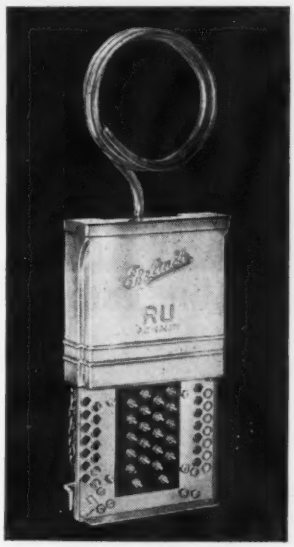
reliable "RU" cable terminal

The results of Reliable's policy of endless research and testing of parts and materials, together with a rugged design simplicity are apparent in this Reversible, Unprotected Terminal.

The flat fanning face plate, in combination with a sturdy non-corrosive aluminum cover which surrounds the wires both front and back, creates an unusually weatherproof terminal.

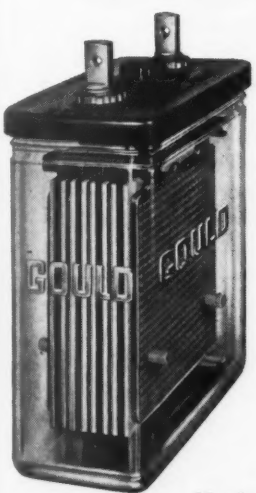
The reversible sliding aluminum cover also permits stub to be mounted at either top or bottom.

Such other features as: detachable mounting bracket; cast cable chamber; guide rings for jumpers; beveled washers; perfect sealing nozzle, etc. add greatly to the installation and service convenience of the Reliable "RU" Terminal, as well as providing an assurance of service life beyond actual field requirements. Ask for complete information on sizes and prices.



"Reliable" identifies the quality

the battery that lasts practically forever



gould planté

For long life and uniform dependable service, no other telephone battery equals the Gould Planté. It has rolled up amazing performance records, remaining in active full-float service for 20 years, 30 years and longer!

In the Planté, *all* of each positive plate is pure lead, containing *no* antimonial impurities. Thus, Gould has eliminated the primary cause of self-discharge, capacity losses and shortened battery life. Planté batteries float at constant voltage and maintain rated capacity all their life. Because they almost never need service, maintenance is negligible. If you would cut battery costs to a minimum, choose Planté.

Made by GOULD-NATIONAL BATTERIES, INC.

ANSONIA Ankoseal

the modern, all-plastic, lightweight telephone cable . . .

saves three ways—

1. Lower first cost
2. Lower installed cost
3. Lower maintenance cost

Available for aerial, duct and direct burial use. For complete information contact your nearest Stromberg-Carlson Field Office.

THE ANSONIA WIRE & CABLE COMPANY

Distributed by STROMBERG-CARLSON

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EQUIPMENT AND ELECTRONIC CARILLONS . . . INDUSTRIAL . . . INTERCOMMUNICATION SYSTEMS . . . TELEVISION

(Continued from page 90)

at by negotiation between buyer and sellers."

The telephone system of Investors "will make a substantial addition to the system of United and will result in further geographic diversification" of the telephone operations of United, the registration filing stated. It was brought out that, in addition, economic diversification for the telephone properties of United will be achieved, since the territory of the Investors' operating companies includes a number of industrial and agricultural activities not found in the areas served by the 300 exchanges of the 12 United operating companies. The Investors' operating subsidiaries furnish telephone service in 118 exchanges.

Certain phases of the operations of both the United Utilities and Investors Telephone Co., may be combined to eliminate duplicating functions and to effect operating economies, the registration statement declared. The registration statement added that "a number of experienced management personnel may join the United organization and strengthen the management group of United."

Benefits From Bell System USITA Toll Compensation

THE BENEFITS from the recent negotiations between the Bell System and the US Independent Telephone Association to establish higher levels of compensation to Independent companies in the handling of interchanged toll traffic were cited in the United's registration statement. The statement declared that for 1953 United estimated an increase of $1,000,000 in gross annual toll revenues for its operating telephone subsidiaries. For the operating companies of the Investors Telephone Co., the registration statement estimated that the increase through higher levels of toll compnsation would amount to $350,000 per year.

The following are the subsidiary companies of the Investors Telephone Co., with the number of exchanges and the total stations served as of the end of 1952: Arkansas Associated Telephone Co., eight exchanges and 2,841 stations; Central Carolina Telephone Co., 26 exchanges and 14,085 stations; Central Missouri Telephone Co., 24 exchanges and 33,210 stations; Iowa State Telephone Co., 40 exchanges and 33,210 stations; Platte Valley Telephone Corp., in western Nebraska and eastern Wyoming with 15 exchanges and 13,627 stations; and the Sussex Telephone Co. of Newton, N. J., with 5 exchanges and 8,756 stations.

The Investors' operating companies serve more than a score of towns with more than 1,000 stations, and among these are Southern Pines and Beaufort, N. C., Lexington and Warrensburg, Mo., Newton, Gering and Scottsbluff, Nebr., and Torrington, Wyo.

The consummation of the acquisition will add four new states in which United does not now have operating subsidiaries—Iowa, Nebraska, North

LIFE IS DIVIDED into three terms — that which was, which is, and which will be. Let us learn from the past to profit by the present and from the present to live better for the future. — *Warp & Woof.*

SENSITIVITY at your COMMAND

WILKINSON Line Locator

One Hand Operation

This electronic sleuth unerringly and accurately locates any underground cable—no matter how deeply buried. Impervious to broadcasting stations or high tension lines. Light . . . handy . . . powerful—it is soundly designed and sturdily built for dependable service.

Immediate Shipment from Nearest Warehouse Points

- Syntron Hammers and Drills
- Mall Chain Saws
- Klein Tools
- Just-Rite flashlights
- Eveready Batteries
- Columbia Gray Label Dry Cells
- Miller Hydraulic Platform Trucks
- Cable Splicer's Tones
- Butane type Splicer's furnaces
- Complete Cable Splicing kits
- Poles and Crossarms
- Copperweld and galvanized steel strand
- J-M Transite
- Pole Line Hardware
- ALL tools for outside construction
- Alphaduct Dated Insulated Wire
- NEW Aluminum-coated steel telephone wire
- Complete Line of Cable Spinning Equipment, accessories, tools and materials

Write for Literature . . . Phone Our Office

TELEPHONE SUPPLY CO. & POWER TOPEKA, KANSAS PHONE 4-2621

Telephone company officials in Warsaw, Ind., have announced the promotion of L. RICHARD STOOPS to the position of assistant secretary and assistant treasurer for United Tel. Co., Inc.; Ohio Telephone Service Co.; and Jasper Telephone Corp. In his new capacity, Mr. Stoops will work under the supervision of GEORGE A. STEELE, vice-president of the three corporations whose general offices are located in Warsaw. Mr. Stoops as been employed as a commercial representative for the Indiana-Ohio properties since June, 1951, when he was graduated from Indiana University with a Bachelor of Arts degree. He is a native of Nappanee, Ind., where his father, LaMAR S. STOOPS, is manager and secretary-treasurer of Napanee Telephone Co.

Carolina and Wyoming. United and Investors both have operating subsidiaries in Arkansas, Missouri and New Jersey. United has operating companies in Indiana, Kansas, Ohio, and Pennsylvania.

The Kidder, Peabody & Co., investment firm will head the underwriting syndicate which will offer the new United issue of stock.

The 12 operating companies of United Utilities, as of the end of last year had a total of 300 exchanges in seven states, serving 227,156 company-owned stations and 13,206 subscriber-owned stations, or a total of 240,362 stations. Last year, United Utilities acquired the McKrae Telephone Co., of Fredonia, Kans., the city of Ellis, Kans., telephone system, the Jasper, Ind. Telephone Corp. and the city of Tarkio, Mo., telephone system, all with a total of 10,000 stations. The largest of the United's operating companies are the United Telephone Co. of Pennsyl-

(Please turn to page 94)

HIGHWAY HD EARTH BORING MACHINE

Digs holes 9" to 20" in diameter, 7' to 10' deep.

Sets poles 40' to 45' in length 2000 to 2500 pounds in weight

IN ANY SOIL . . .

The famous Highway Model HD Earth Boring Machine digs holes quickly and easily in any soil. Light enough for mounting on one and one-half ton truck. Or, can also be mounted on a tractor. Requires only six feet of platform space. Operates from truck platform where operator has clear vision. Quickly adjusted to dig at any angle. Single drive from engine furnishes all power.

A 2500-pound capacity winch and a pole derrick to handle 40-foot to 45-foot poles can be furnished with the Model HD as optional equipment. No separate drive from engine is needed for operation of their accessories.

Also available are the Model HC Earth Boring Machine for extra-heavy duty work and the Model P. E. Digger, an economical, completely portable machine for the occasional user.

Send today for your complete Highway Public Utility Equipment catalog. Or, for quick, first-hand information, call or visit the friendly Highway Distributor or Factory Branch nearest you.

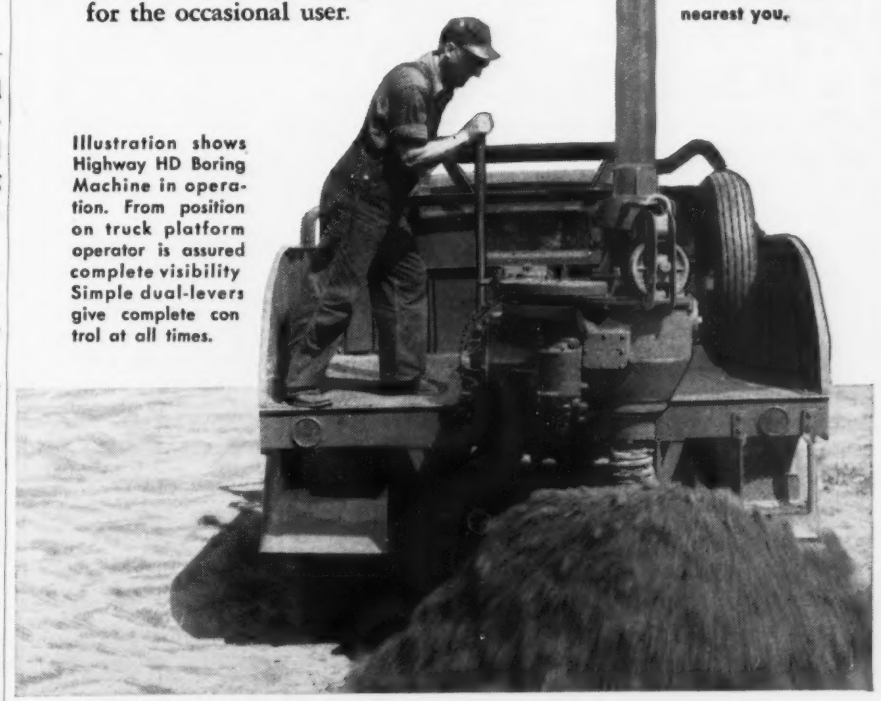


Illustration shows Highway HD Boring Machine in operation. From position on truck platform operator is assured complete visibility Simple dual-levers give complete control at all times.

HIGHWAY TRAILER COMPANY

Headquarters: Edgerton, Wisconsin

PLANTS AT EDGERTON, WISCONSIN—STOUGHTON, WISCONSIN

The nation's largest manufacturer of Utility Truck Bodies • Earth Boring Machines • Pole and Cable Reel Trailers • Winches • Power Take-offs • Service Accessories

vania, with 69,399 stations; United Telephone Co. of Indiana, 55,456 stations, American Telephone Co. of Kansas, 34,975 stations; United Telephone Co. of Missouri, 34,197 stations; and the Ohio Telephone Service Co., 20,864 stations.

United Utilities has had a progressively good and sound earnings record in the postwar years, the registration statement brought out. Its 12 telephone operating companies constituted 85.4% of consolidated operating revenues, with electric service 10.6%, gas 2.9% and miscellaneous (a utility merchandising company) 1.1% of the total. United is planning to convert to dial operation, it was cited, certain of its larger exchanges as the present manual equipment becomes inadequate and to convert to dial certain small exchanges which can be economically tied in as satellites of nearby larger exchanges. It added that extensive conversions from magneto to common battery are being made in preparation for later dial conversion. As of the end of last year United had 34 dial exchanges with 24,608 stations, a total of 144,369 common battery stations, and 58,179 magneto stations. The United construction program for improvement and expansion of facilities last year amounted to $32,470,549.

In Stations Since 1948 Investors Had 43.7% Increase

THE INVESTORS Telephone Co. has had an increase in telephones during the postwar years from 61,833 in 1947 to 86,672 at the end of last year. Of the Investors' stations, 17,097 are dial, 47,717 are common battery, and 18,841 are magneto. Last year's construction program of Investors amounted to $8,229,955 in gross additions to plant, and the Investors system had an increase of 43.7% from 1948 to 1952 in telephones served. At the end of last year, the Investors companies had 1,290 unfilled applications, and approximately 900 party lines subscribers wanting upgraded service. Since 1947 the Investors subsidiaries have secured rate relief amounting to an increase of $723,800 in gross annual revenues. As of the end of 1952, United had a total of 3,410 employees and the Investors' companies had a total of 1,054.
—THE END

Firing or Forming?

"THE EASY thing to do, the line of least resistance, is to fire the man. That way, however, the man not only loses his job but the firm loses all the man's experience, background, training and skill, The better thing to do is to *form*, not fire, the man. If we can form him so he will fit in with others, and fit the position we have for him, then we have saved the man's job and we have conserved the investment we already have in him."

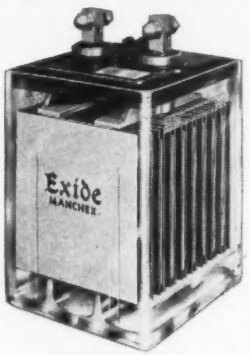
I heard the president of a large organization give the above advice to one of his foremen. This president has been very successful because he is a man-builder. Like a master sculptor he chips away the undesirable qualities from an employee's personality until the master worker stands revealed. Often he finds that some easily corrected personality defect is the only reason for a man's failure. Sometimes problems in the home are the cause. Discovering the reasons for wrong mental attitudes and wrong habits and removing the causes often conserves valuable workers for the firm. By studying men as human beings and taking a deep personal interest in each man, he has built one of the finest organizations of its kind in the country.

Melvin Evans, a Chicago Management Engineer, says that a typical industrial group may be classified as follows: 1% are superior, alert, open-minded, skilled, aggressive and have pleasing personalities and strong characters. 12% are skilled, 27% are open-minded and willing to grow mentally. 60% are indifferent and mentally unorganized.

My President friend has found that much can be accomplished by training and guiding the willing 40%. And he even has been successful in arousing and inspiring some of the men in the 60% group. He does not believe in firing a man until he has made every effort to form that man into a successful worker.—*Author Unknown.*

Construction Ma
With the Double Gu
and America's Lea

Exide-Manchex
telephone batteries



assure
positive operation

For Central Office
and Private Branch
Exchange Equipment

This is proven daily in exchanges of every size . . . for over 60 years Exide Batteries have been serving the Telephone Industry . . . the Manchester positive plate with its exclusive button type construction provides exceptionally long life . . . latest developments on molded glass jars permit compact space saving installation . . . heavy terminal posts with copper inserts provide extra conductivity for sustained voltage at high discharge rates . . . microporous rubber along with slotted plastic separators are impervious to chemical and electrical reactions . . . plastic spacers assure plate alignment . . . for assured dependability, long life and low-cost maintenance use Exide Manchex

The Electric Storage Battery Co.
Philadelphia, Pa.

1888 . . Dependable Batteries
for 65 Years . . . 195

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TELEPHONES . SWITCHBOARDS . SOUND

Materials and Supplies . . .

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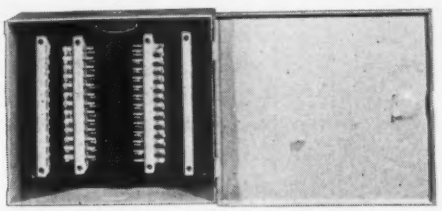


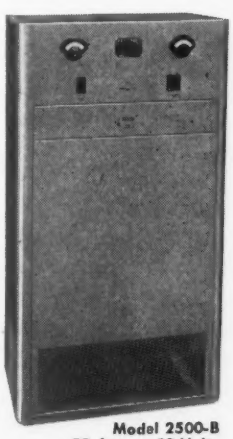
cook type "57" interior terminal box

The type 57 interior terminal box is for distribution and termination of lead-covered or loom cable for low-voltage circuits. The box itself which has an Underwriters' Laboratory listing is constructed of smoothly enameled steel, with hinged cover and necessary knock-outs. Fanning strips and terminal strips are provided as well as screw connectors on the drop sides and solder clips for cable wires.

here's how the 3-phase

flotrol automatic battery charger

reduces operating costs!



Model 2500-B
50 Amps., 50 Volts

GREATER POWER SAVINGS—The unusually high efficiency of this 3-phase self-contained unit (50% at 10% of rated load and 75% at 40% rated load), results in continuous power savings to the FLOTROL user, sufficient to pay for the unit in less than its anticipated life.

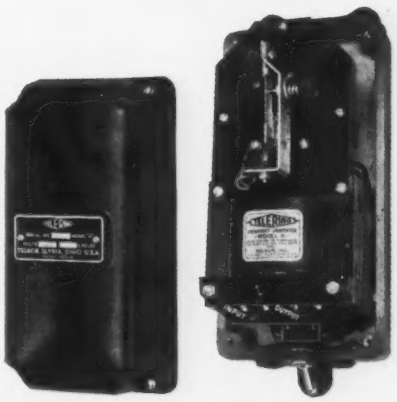
REDUCED MAINTENANCE COSTS—The FLOTROL contains no moving parts; once installed, requires no further attention.

MAXIMUM BATTERY LIFE—By floating the battery at constant voltage, battery activity is reduced to a minimum.

DC voltage delivered is regulated within 1%. Complete overload protection is as automatic as charging itself.

WRITE for Bulletin 161—completely describing the FLOTROL system for 3-phase operation.

for TELEPHONE RINGING POWER



Model "R"
4" x 4½" x 10"
Wt. 7½ lbs.

TELERING

is best in
- PRICE
- PRINCIPLE
- PERFORMANCE

An excellent ringing machine for telephone systems large or small, civilian or in military service.

ALTERNATING and DIRECT CURRENT operated units.

Rated output of standard unit, operating on 110-115 V, 60 CPS is Approx. 90V, at 20 CPS, 30w. Data on units operating on other voltages and frequencies furnished on request.

"You will be pleased with your investment"

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Instant HEAT

that's "QUICK ON THE TRIGGER"
and "RIGHT ON THE TARGET"

USE THE

WALL
TRIG·R·HEAT
SOLDERING IRON
READY TO SOLDER IN SECONDS

$11.95

HEAT-CONTROL *Thermostatic Action guaranteed for the life of the iron, or double your money back!*

Yes—the heat is QUICK! Just touch the trigger, and in seconds TRIG-R-HEAT is ready to solder. Heat is RIGHT, too! An amazing, exclusive thermostatic action *(without the use of transformers or fragile thermostats)*, quickly brings TRIG-R-HEAT to "on-the-target" soldering temperature and *keeps* it there. Iron is never too cool for efficient work—never too hot for the good of the tip. The result—solder doesn't fuse to iron, so tips last two to three times as long as those on irons without this exclusive feature. A built-in spotlight makes dark, hard-to-reach places easy to solder. Wattage starts at approximately 400 watts and idles at about 100 watts. Operates on 115-120 volts, AC or DC. Get Wall TRIG-R-HEAT at your dealer's *today!*

OVER 20,000,000 SOLDERING PRODUCTS SINCE 1864

SOLDERING PRODUCTS WALL The Safety Line SINCE 1864

WALL MANUFACTURING CO.
GROVE CITY • PENNSYLVANIA

J. M. Nelson Heads Louisiana Association

THE LOUISIANA Telephone Association on Feb. 13 elected J. M. Nelson of Welsh, as president, and heard from a Rural Electrification Administration official a vigorous denial that the REA was attempting to "muscle in" on businesses operated by its borrowers.

Nelson, division manager of the Southwestern States Telephone Co. succeeds Al M. Cobb, manager of the La Salle Telephone Co. at Jena.

Walter E. Rich, head of the southwest section, telephone loans division, REA, told the convention that the federal agency never attempts to interfere with the operations of its borrowers. Said he:

"Don't worry about an REA man sitting on your doorstep watching your every move. We feel our borrowers are responsible for the successful operation of their own businesses. We want to limit our administration as rendering to them such advice and assistance as they see the need for, so that operations can be on a sounder basis and result in a better return to them and maximum loan security to the government."

In similar vein, retiring President Cobb deplored what he said was a feeling in some quarters that the REA sought to control the affairs of its borrowers. He said he would strenously resist any effort within the association to break it up into cliques of REA borrowers and non-borrowers.

Rich described as "good, sound advice" the suggestion to the convention by public service commissioner Nat B. Knight, Jr. that telephone companies investigate the source of their financing before making any commitments, particularly as regarded REA financing.

"We, of course," said Rich, "feel the REA program is the program which will best fit your needs because it is designed specifically for that purpose."

Knight, in making his recommendation, had spoken rather severely of REA procedures, especially those which he said gave the federal agency say-so in the affairs of the company.

John A. Brady, Sr., Golden Meadow, president of the Lafourche Telephone Co., Inc., and association sec-

retary, urged planning in record-keeping, public and employee relations and planning in organization "because no company is self-sufficient." He emphasized the necessity of sound management, particularly in the selection and training of personnel.

The group elected as vice-president Clarke Williams, president and manager of the Oak Ridge Telephone Co. Earl Conrad, president and manager of the Breaux Bridge Telephone Co. was re-elected treasurer. Brady was re-appointed as secretary, and as a member of the executive committee. Other appointments to that committee were Lonnie Clark, replacing C. J. deBlanc as connecting company relations manager with Southern Bell; Cobb; F. N. Banker, Gonzales, president and manager of the East Ascension Telephone Co., and Earl Conrad, president of the Breaux Bridge Telephone Co.

Elected as members of the board of directors were Conrad, W. L. Henning, Sulphur lawyer and president of the Cameron Telephone Co. and Banker.

Sales & Purchases:

HARLEM, GA. — The Federal Communications Commission has authorized the *Southern Bell Telephone & Telegraph Co.* to buy the *Harlem (Ga.) Telephone Co.*

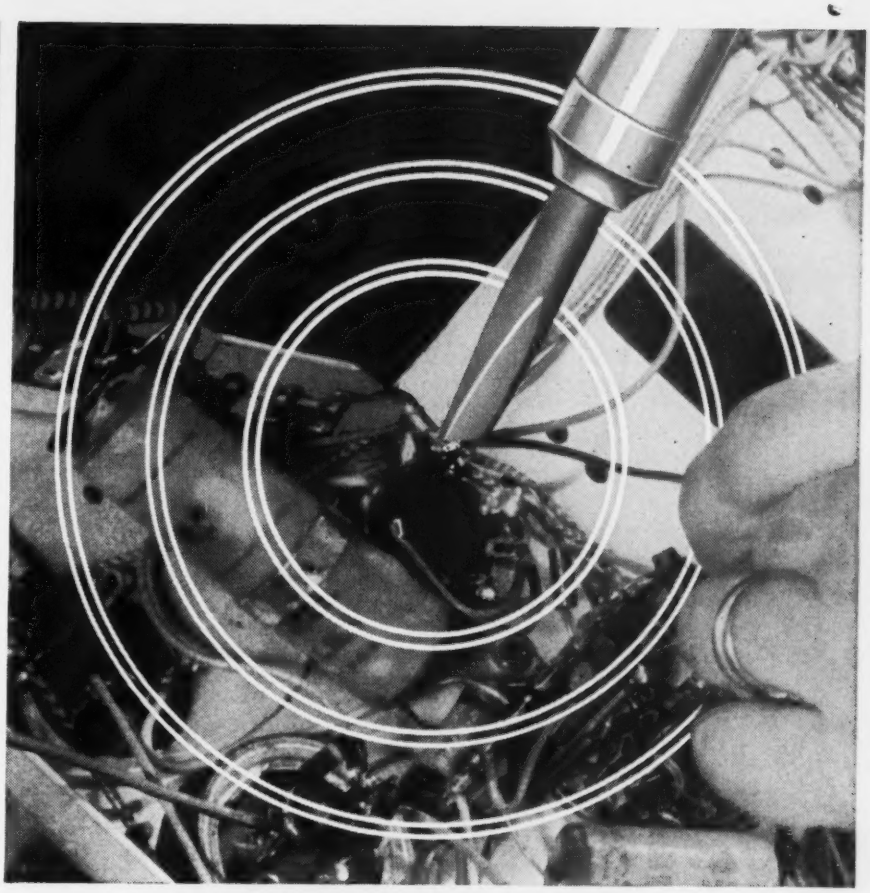
Bell will pay $16,765 for the Harlem company which serves 230 customers in Columbia and McDuffie counties.

MACOMB, ILL.: The *McDonough County Telephone Cooperative* has purchased the *Adair Telephone Co.*

The Adair company will continue to serve the Adair community with telephone service until the cooperative takes over the service.

DUSTIN, OKLA. — Announcement has been made of the purchase of the telephone exchange at Dustin by Herman Graves. The system was purchased from Cecil Williamson, Hanna.

Graves stated the system was being turned over to a brother-in-law for operation and that he would continue his position as maintenance supervisor with the *Southwestern States Telephone Co.*, Purcell, Okla. He has served with this company for 25 years.



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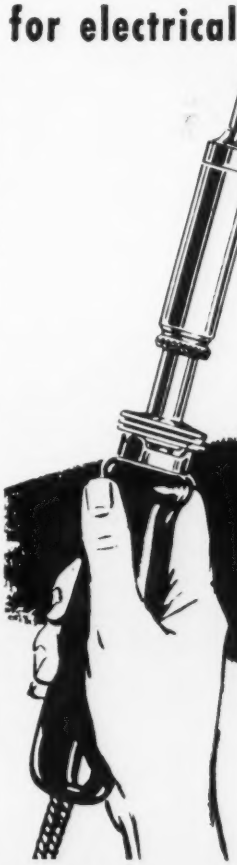

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A monthly report of rural telephone loan allocations approved by the Rural Electrification Administration (REA).

LOAN RECISSIONS: At the request of the borrowers, REA on March 3 rescinded the following allocations: *Hawkinsville Telephone Co., Hawkinsville, Ga.*, $278,000; *Sullivan County Telephone Co., Forksville, Pa.*, $122,000; *Santa Anna Telephone Co., Santa Anna, Texas*, $152,000.

• • •

ALABAMA: *Leeds Telephone Co., Leeds, Ala.*, $141,000, second loan to this borrower. Approved February 20.

These loan funds will be used to finance the construction of 13 miles of line not provided for in the first loan, and an increase in the proportion of graded service, (private, semi-private or 4-party lines.) It will also cover increased construction costs since the first loan of $328,000 was approved in May 1951.

Construction is proceeding satisfactorily on the first loan. The central office equipment contract for both the Leeds and the Odenville central offices has been approved as well as final plans and specifications for outside plant.

When the expansion and improvements possible under the two REA loans are complete, almost 1500 subscribers will receive dial telephone service. The completed system will consist of 120 miles of line in Shelby, Jefferson and St. Clair Counties.

• • •

ARKANSAS: On Mar. 10 REA rescinded $216,000 allocation made to Public Service Corp., Newport, Ark., on June 30, 1950.

• • •

GEORGIA: REA has approved a loan contract with the *Brantley Telephone Co., Nahunta, Ga.*, in the amount of $181,000, an increase of $65,000 over the original allocation. Revised plans of the borrower provide for service without toll charge between the two central offices of the system and for commercial office facilities, which where not included in the original allocation.

• • •

KANSAS: *Central Kansas Telephone Co., Florence, Kans.*, $73,000 second loan to this borrower. Approved Feb. 16.

These loan funds will be used for the construction of facilities to serve 33 subscribers not provided for in the first loan of $114,000 approved in July, 1952; also to rebuild property destroyed by the flood at Saffordville which made necessary the relocation of 68 of the existing subscribers. In addition, the funds will cover increased costs since the original loan was approved.

The modernization and expansion possible under the two REA loans will bring service to 344 rural subscribers in Chase County. The completed system, consisting of 145 miles of line, will operate unattended dial offices at Cedar Point and Saffordville.

• • •

KENTUCKY: *Mountain Rural Telephone Cooperative Corp., Ezel, Ky.*, $288,000, second loan to this borrower. Approved March 12.

This REA loan will be used to finance the construction of 47 miles of line not included in the first loan as well as for additional trunks to handle extended area and toll traffic services. Also the loan will cover increased construction costs since the original loan of $455,000 was approved in June 1951.

The two REA loans will enable the borrower to provide modern tele-

phone service to 1,325 subscribers in Morgan, Wolfe and Elliott Counties. Dial central offices for the new system will be located at West Liberty, Sandy Hook, Hazel Green, Ezel and Campton. Service without toll charge is planned between several of the exchange areas.

The completed system will consist of 354 miles of line, and it will have capacity to serve all applicants in the area desiring telephones.

• • •

LOUISIANA: *Reserve Telephone Co., Reserve, La.*, $263,000, second loan to this company. Approved March 10.

These loans will be used for expanded telephone facilities to handle 710 subscribers not provided for in the first loan. The present dial office at Reserve will be replaced with a new combination commercial and central office, a new dial central office will be installed at Garyville, and nine additional miles of line built. In addition, there will be an increase in graded service over what was expected when the first loan of $93,000 was approved in November 1950. Service without toll charge is planned between the two exchange areas of the system.

In addition, this loan will cover increased construction costs involved since 1950.

The modernization and expansion possible under the two REA loans will enable the borrower to serve 1,278 subscribers in St. John the Baptist Parish. The completed system will consist of 36 miles of line and will have basic plant capacity to meet the needs of all potential subscribers in the operating area.

• • •

LOUISIANA: On Mar. 9 REA rescinded $111,000 allocation made to the Plain Dealing (La.) Telephone Co., Dec. 21, 1951.

• • •

LOUISIANA: *Star Telephone Co., Maringouin, La.*, $164,000, the second loan to this company. Approved March 4.

These loan funds will be used for facilities to bring telephone service to 164 subscribers not provided for in the first loan. In addition, they will cover increased construction costs since the original loan of $110,000 was approved in Sept., 1951.

There will be no toll charge for calls between the three exchange areas of the system. Dial central offi-

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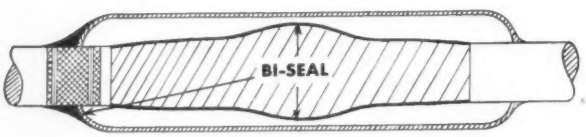

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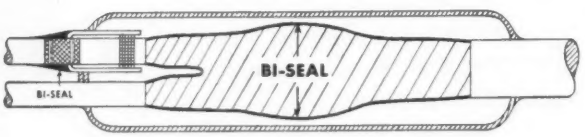

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ces will be located at Maringouin, Rosedale and near Lovonia. When the improvements and expansion possible under both REA loans are completed, the system will consist of 91 miles of line serving 614 rural subscribers in Iberville and Point Coupee Parishes.

• • •

MASSACHUSSETTS: *Granby Telephone & Telegraph Co., Granby, Mass.*, $125,000, second loan to this borrower. Approved March 11.

This REA loan, together with the first loan of $40,000 approved in May 1951, will be used by the borrower to improve, modernize and expand the present telephone system now serving 403 subscribers in Hampshire county.

The greater part of the line will be rebuilt, three miles of new line added and a new unattended dial office constructed at Granby Center. These added facilities will bring modern telephone service to the existing subscribers as well as 202 new ones.

The completed system will consist of 46 miles of line and will be designed to meet the needs of all potential subscribers in the operating territory.

• • •

MISSOURI: *Grand River Mutual Telephone Corp., Trenton, Mo.*, $960,000, the second loan to this borrower. Approved February 19.

This loan, together with the first loan of $896,000 approved in April 1952, will be used for the acquisition, rehabilitation and integration of the Galt Telephone System, and the Laredo Telephone Company, both of Carrollton, Mo., and 19 local systems from the Middle States Utilities Company of Missouri, and the Middle States Utilities Company of Iowa. These facilities are now providing magneto and common battery service through 24 central offices to 6,785 subscribers, including 641 switchers, over 1,599 miles of line.

The two REA loans will enable the borrower to build 885 miles of new line and install automatic dial central offices at Galt, Spickard, Laredo, Mercer, Brimson, Mill Grove and Goshen, all in Missouri. The outside plant facilities connected with the remaining 17 manually-operated central offices acquired from the Middle States Utilities Company will be rehabilitated and integrated into the new system. These offices are at:

Bethany, Blythedale, Cainsville, Gilman City, Jamesport, Mt. Moriah, Princeton and Ridgeway, in Missouri; and Allerton, Clio, Davis City, Garden Grove, Lamoni, Leon, Lineville, Pleasonton and Weldon, in Iowa. Service without toll charge is planned between several of the borrower's exchange areas, and similar service is contemplated between some of the mutual's areas and nearby trading centers.

When the modernization and improvements possible under both REA loans are completed, all of the existing as well as 930 new subscribers will benefit. The system, made possible by these two loans, will consist of 2,164 miles of line in Grundy, Mercer, Harrison, Putnam, Sullivan, Livingston and Linn Counties in Missouri, and Decatur, Ringgold, Wayne and Clarke Counties in Iowa.

• • •

NORTH DAKOTA: *Dakota Central Rural Telephone Cooperative Association, Carrington, N. D.*, $419,000, to improve and expand rural telephone service in Stutsman County. Approved March 5.

The newly-organized cooperative proposes to acquire the telephone properties of the Bohl Telephone Exchange, Woodworth, North Dakota, The Medina Telephone Co., Medina, and two switcher companies—Farmers Fairview Telephone Co., and Northwest Farmers Telephone Co.—now being served by the Bohl Telephone Exchange. These facilities are now serving 167 subscribers including 30 switcher stations.

With the REA loan, the borrower plans to convert the Woodworth and Medina central offices to dial operation, and build 388 miles of new line. The modernized and expanded telephone system will provide modern service to 573 subscribers, and switching service to 22 rural families now being switched by the Medina Telephone Co. They will rebuild their own lines. There will be no toll charge for calls between the areas.

The completed system will consist of 417 miles of line, and will be designed to meet the needs of all potential subscribers.

• • •

SOUTH CAROLINA: *St. Matthews Telephone Co., St. Matthews, S. C.*, $97,000, second loan to this company. Approved March 12.

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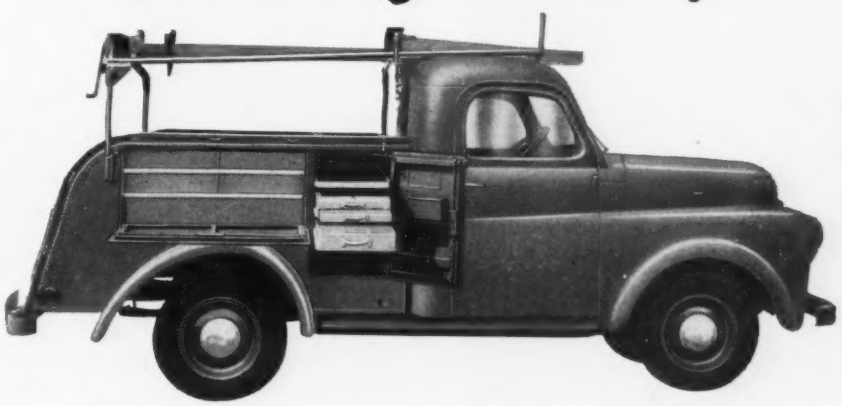

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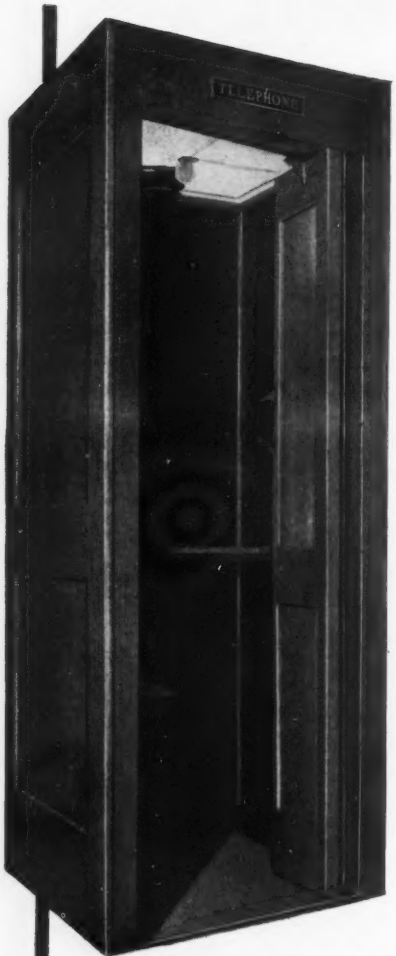

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crease in construction costs since the first loan of $182,000 was approved in March 1952. In addition, some of the money will be used for the company's share of the cost of carrier equipment between the St. Matthews central office and Orangeburg, not included in the first loan. This equipment, to be installed jointly by the company and *Southern Bell Telephone Co.*, will provide six channels for long distance calls to be handled by Bell from the Orangeburg toll center.

Progress under the first loan has been rapid. Construction of the two central office buildings is practically complete, and installation of the dial equipment is scheduled to start shortly. Service is expected to start in Auguest.

The borrower contemplates service without toll charge between the two central offices at Creston and St. Matthews. When the modernization and expansion possible under both REA loans are completed, a total of 690 subscribers in Calhoun and Orangeburg counties will receive new and improved service.

• • •

SOUTH CAROLINA: On Mar. 11 REA rescinded loan allocation made to Bowman (S. C.) Telephone Co.

• • •

Division Lead Announces New Line of Solders

JOE A. STONE, executive partner of the Division Lead Co., 7742 W. 61st Place, Summit, Ill., has announced the firm is now pioneering in transistor solders and fluxes.

Though the field is new, Divco transistor solders and fluxes are already in use by a number of leading manufacturers. Outstanding in the line of fluxes is Divco No. 335, which can be used to solder copper-plated, unplated etched, or unplated, unetched germanium—and which contains no ammonium compounds to hasten stress cracking of delicate copper, brass, or phosphor-bronze parts. Divco indium and tin solders are alloyed to provide the desired electrical characteristics for any application.

Mr. Stone—whose firm recently purchased the Metallic Products Division of Eagle-Picher — says that the new line of transistor solders and fluxes is only one of many new pro-

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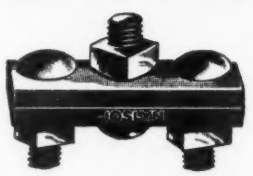

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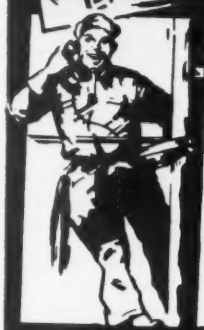

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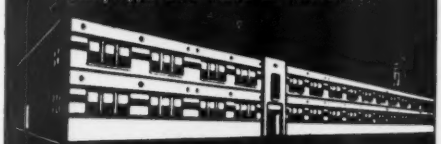

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duct lines to follow on the company's recent expansion of research and production facilities.

Cook Electric Announces New P-L-X Terminal

THE COOK Electric Co., Chicago, Ill., recently announced a newly developed unprotected terminal for use with plastic cable. The plastic loop unprotected cable terminal (P-L-X) is constructed to make it possible to loop the cable through the terminal

New Cook P-X-L Terminal

and at the same time provide a simple and positive means of terminating any number of cable pairs desired, with no soldering of connections. The cable chamber, cover, and bracket are of all metal construction with ample room for cable, preventing the possibility of shorts and grounds.

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D. H. Deaver to Head Automatic Supply Sales

THE APPOINTMENT of Darwin H. Deaver as manager, Supply Sales, Automatic Electric Sales Corp., Chicago, has been announced by L. H. Warner, president. Mr. Deaver assumed his new duties on March 1, 1953, succeeding Carl W. Schwob. During the past several months Mr. Deaver has been engaged in special administrative assignments as assistant to the vice president and chief engineer of Automatic Electric Co. Prior to this

(Please turn to page 105)

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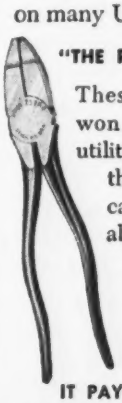

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(Continued from page 103)

assignment, he served for several years as executive assistant to L. H. Warner, president of the Sales Corporation.

Mr. Deaver graduated from Washburn College, Topeka, Kans., in 1935, with a Ph. B. degree, and has a master's degree from the Harvard Graduate School of Business Administration. During the 15 years since completing his graduate work, he has

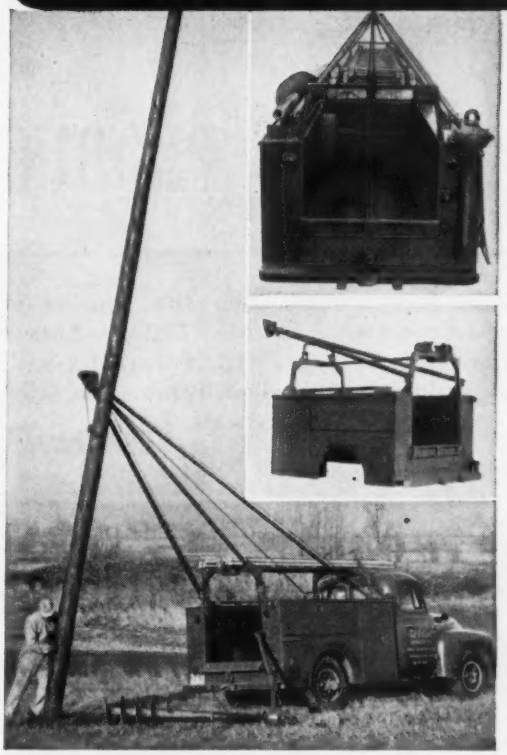
D. H. DEAVER

held a succession of important administrative positions both in business organizations and in the United States Navy. He first served in the investment department of Continental Casualty Company, and in September 1941, he was called to active duty in the U. S. Navy as an Ensign. He was released in 1945 with the rank of Lieutenant Commander.

Joining Automatic Electric Sales Corp. in August 1949, Mr. Deaver was appointed executive assistant to the president. In this capacity he successfully carried out a wide variety of special studies and assignments which brought him into intimate contact with the company's operations and administration of the field selling force. With the exception of a brief recall to active duty with the Navy, he continued in this position until his recent assignment to the chief engineer's office.

In his new position as manager, supply sales, Mr. Deaver will have direction of all sales and promotional activities on products handled by the Automatic Electric Supply Division.

Two-Man COMBINATION TRUCKS Pay Dividends



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ADVERTISING, Directories — *General Telephone Directory Co., 604 Pine Ave., Long Beach, Calif., and 1800 Busse Highway, Des Plaines, Ill.*—[ADV. 1]

BELTS — CLIMBERS — COMPLETE LINEMEN'S EQUIPMENT, *W. M. Bashlin Co., Bashlin Bldg., Grove City 1, Pa.*—[ADV. 2]

BELTS — CLIMBERS — PLIERS — SAFETY STRAPS — CONSTRUCTION TOOLS. *Klein & Sons, Mathias. 3200 Belmont Ave., Chicago 18. Ill.*—[ADV. 3]

BOOTHS—Acoustic Telephone — *Sherron Metallic Corp., 1202 Flushing Ave., Brooklyn 6, N. Y.*—[ADV. 4]

BRUSH & WEED KILLERS — *Thompson manufactures many types of brush and weed killers. Write for helpful information on specific problems. Thompson Chemicals Corp., St. Louis 3, Mo.*—[ADV. 5]

CABLE, All Plastic, *Aerial, Duct, Direct Burial, PBX, Switchboard.* — *The Ansonia Wire & Cable Co., Ansonia, Conn.*—[ADV. 6]

CORDS, Switchboard, Instrument and Operators —*Commercial Cord & Supply Co., Inc., 26 Main St., Clifton Springs, N. Y.*—[ADV. 7]

CORDS, Switchboard & Telephone — *Runzel Cord & Wire Co., 4727-31 Montrose Ave., Chicago 41, Ill.*—[ADV. 8]

ELECTRIC HOT WATER HEATERS. *Thermostatically controlled for any hot water heater, Vulcan Electric Co., Danvers 17, Mass.*—[ADV. 9]

FURNACES — For quickly and economically melting lead and paraffin — *Mutual Liquid Gas Equipment Co., Inc., 3600 W. Imperial Highway, Los Angeles, Calif.*—[ADV. 10]

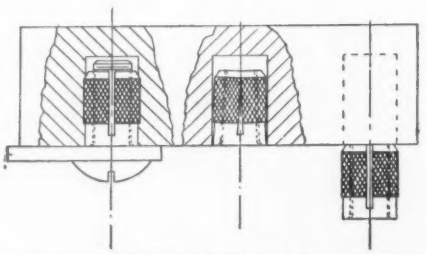
INSULATORS, Porcelain — *Porcelain Products Inc., Box 300, Findlay, Ohio.*—[ADV. 11]

LIGHTWEIGHT PULLERS — *Coffing Hoist Company, 800 Walters St., Danville 5, Ill.*—[ADV. 12]

PIPE PUSHERS — *Giant Manufacturing Co., South 6th St., at 12th Ave., Council Bluffs, Iowa.*—[ADV. 13]

POLE HOLE DIGGERS — *For derrick mounted trucks. Tele-E-Lect Products, Inc., 9613 Minnetonka Blvd., Minneapolis 16, Minn.* —[ADV. 14]

POLES, Southern Yellow Pine — *Colfax Lumber & Creosoting Co., Inc., P.O. Box 23, Pineville, La.*—[ADV. 15]



SCREW LOCKING INSERT: — A new design has been added to the line of Brush Screw Locking Inserts — devices for providing threads in blind holes in all kinds of materials.

The new number is known as a "knurled insert." The three-stage principle of operation is shown above; it is the principle common to Brush inserts. The new item is distinguished by a large band of diamond knurling on its grip area.

This knurling makes for superior contact when used in hard and dense materials, such as molded plastics or metal castings, and also provides high resistance to torque.

Since they are simply pushed into plain round holes, these inserts eliminate the many difficulties of molding-in inserts. Besides locking the screw they require no special tools and there is no quicker way to provide screw threads for blind fastening in all kinds of materials.

POLES, Southern Yellow Pine — *Taylor Colquitt Company, 290 E. Main St., Spartanburgh, S. C.*—[ADV. 16]

POLES, Southern Yellow Pine — *Texas Creosoting Co., Orange, Texas.*—[ADV. 17]

PROTECTIVE EQUIPMENT — *Reliable Electric Company, 3145 Carroll Avenue, Chicago 12, Ill.*—[ADV. 18]

REBUILT TELEPHONE & SWITCHBOARDS — *Telephone Repair & Supply Company, 1760 Lunt Avenue, Chicago 2, Ill.*—[ADV. 19]

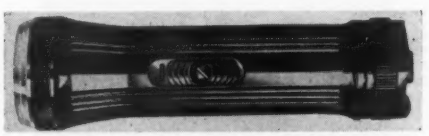
TRUCK BODIES — *Highway Trailer Co., Edgerton, Wisc.*—[ADV. 20]

WIRE, Insulated — DATED DROP WIRE — Neoprene or Weatherproof — *Alphaduct Wire & Cable Co., Milltown, N. J.*—[ADV. 21]

WIRE, Insulated Drop and Bronze or Copperweld — *Acorn Insulated Wire Co., Inc., 36 Freeman St., Pawtucket, R. I.*—[ADV. 22]

WIRE, Telephone, *for all inside and outside uses* — *Whitney Blake Co., New Haven, Conn.*—[ADV. 23]

Standard knurled inserts are made of aluminum, but are available in other materials and in a range of sizes to accept screws from 4-40 to ¼-20. — For full information, check New Product 503.



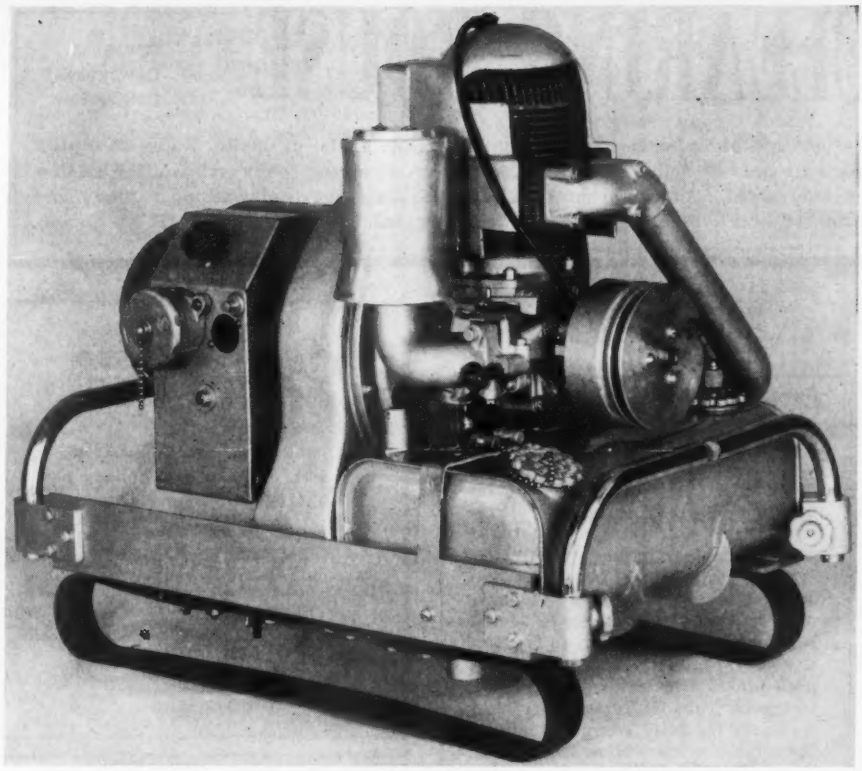
FLASHLIGHT: — The Bright Star Battery Co. has introduced a new "Lifetime Flashlight", fully covered by guarantee for the life of the flashlight against damage due to corrosion.

A seamless, break-resistant plastic body provides rain-proof, water-shielded construction as well as a sleek, modern appearance. A newly-perfected, corrosion-proof switch marks a victory over a problem long battled by flashlight makers and flashlight owners. Demountable, this switch may be replaced if it becomes worn. The life of the flashlight is not limited to the life of the switch.

The Lifetime Flashlight offers, in addition, Bright Star's glow-in-the-dark lens, which shows a rim of light even when the flashlight is placed bulb-downward in an upright position. Not only does this side-light rim serve as a switch-off reminder to forgetful users, but it also endows the flashlight with double duty use as a night light.

Features for protection include a shock-resistant bulb mounting and a protective plastic inner shoulder for added strength. Features for convenience include a scientifically prefocused beam, an extra bulb carrier, and a handy ring hangar. — For complete data, Check New Product 504.

IF YOU DO not see a listing in these columns of products or services you are interested in write "Buyers' Directory", 7720 Sheridan Road, Chicago, Illinois, for such information.



GENERATOR: — A new Dual-Voltage 5 Kilowatt carryable generator, designed to meet modern industry's growing needs, has been announced by Homelite Corp., Port Chester, N. Y. The new generator, Model 32A115/230-1, will carry a continuous load of 5,000 watts, single-phase, 60 cycle alternating current at either 115 or 230 volts. It is a carryable generator with enough power to start and operate a great variety of electric tools and equipment such as electric saw, grinders, drills, routers, tampers, in the construction and transportation fields, and for emergency lighting and standby power for municipalities, communication companies, farms, homes, etc.

A 115 volt AC standard convenience outlet is supplied, together with a special waterproof 3-pole receptacle for connecting either 115 or 230 volt motors, tools and appliances. Driven by a Homelite Model 32 gasoline engine, the generator has specially impregnated armature and coils to give high resistance to oil, moisture, and abrasive dust. For maximum compactness, the armature is keyed directly to the one-piece, drop-forged, engine crankshaft; and the large size carbon brushes are easily accessible. Voltage regulation from no load to full load is approximately 4%.

Built to withstand the roughest use, the Homelite generator has ball and needle bearings at every point of friction. Pressure vapor oiling system assures adequate lubrication of all engine parts. All major castings are of durable aluminum alloy. Rain and dust proof ignition, plus an adjustable jet-type pressure fuel system makes the Homelite one cylinder, air cooled, 2 cycle gasoline engine easy to start in the coldest, wettest weather.

The unit has adjustable handles for 2 or 4 man carrying. Dimensions are: 29" long, 24½" wide, 25½" high. The generator, complete with gasoline engine, weighs only 228 pounds. — For complete data, Check New Product 505.

SEND IN THIS COUPON FOR MORE INFORMATION

Telephone Engineer Publishing Corp.
7720 N. Sheridan Road
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Please forward complete information on the following products and services described in the April, 1953 issue of TELEPHONE ENGINEER & MANAGEMENT. (Check information desired.)

NEW PRODUCTS

NP 503 NP 504 NP 505

SERVICES AND SUPPLIES

ADV. 1	ADV. 2	ADV. 3	ADV. 4	ADV. 5
ADV. 6	ADV. 7	ADV. 8	ADV. 9	ADV. 10
ADV. 11	ADV. 12	ADV. 13	ADV. 14	ADV. 15
ADV. 16	ADV. 17	ADV. 18	ADV. 19	ADV. 20
	ADV. 21	ADV. 22	ADV. 23	

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DRIVE HOOKS — Galv. Forged Steel. Designed for easy driving into the pole. Used by Telephone and Electric Companies for service drops. 5" x 7/16" ... Per C $11.03

TERMINAL BRACKETS with KNOB — For dead-ending communication lines. 7/16" mounting hole ... Per C $58.77

ANCHOR RODS — SINGLE STRAND EYE — Galv. Forged Steel — The forged eyes are designed to hold the strand in full cylindrical form. Strand can be pulled through the eye without kinking and pulling slack is any easy task.

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STRAND EYE ANGLE BOLTS — Galv. Forged Steel. Used on poles for guying, thus eliminating need for plates and hooks. Radius forged into eye eliminates need of guy wire thimble.

5/8" x 8" ... Per C $53.07
5/8" x 14" ... Per C $59.10
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KEARNEY SOLDERLESS CON-NEC-TITES — Compact, electrically and mechanically, connection are easily made with these. For making bridge or test connections. 12 BWG — 12 NBS Iron to Copper ... Per C $17.71

GUY THIMBLES — Galv. Steel. Used when strand must be fastened to fitting without radius. Protects strand. 3/8" strand size ... Per C $ 7.11

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1 1/4" round — 1/2" hole Per C $ 9.60
1 3/8" round — 9/16" hole Per C $14.40

CABLE SUSPENSION CLAMPS — Galv. Steel. The clamps may be supported either by a machine bolt or double arming bolt thru the pole and one or more nuts or square washers are placed between the clamp and the pole to provide clearance for the cable. One-bolt type — 1/4" — 7/16" strand ... Per C $21.32

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MACHINE BOLTS — Galv. Steel. With rolled threads, square heads and square nuts.

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LAG SCREWS — Galv. Steel — Gimlet Point. 3/8 x 4" ... Per C $ 4.43

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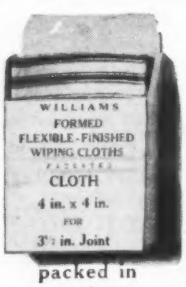

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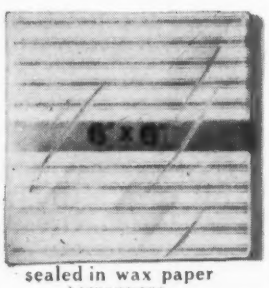
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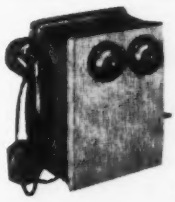

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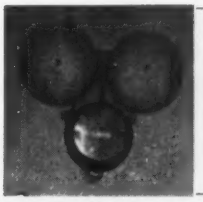

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For Better Construction *SAFER* Maintenance

Tempo To Distribute "Super Slugger" Line

TEMPO PRODUCTS Co., Cleveland 15, Ohio, has been appointed National Sales Distributors for "Super Slugger" electric hammers and the complete line of "Super Slugger" tools.

Noble & Stanton, Inc., Bedford, Ohio, who introduced the "Super Slugger" line several years ago, will continue to manufacture the hammer and tools but all sales will be through the Tempo Products Co.

Tempo has representatives and distributors in all principal industrial areas of the country. The Tempo organization, headed by John R. Kaiser, with Robert R. Elliott as sales manager, is well known as a pioneer in the field of powder actuated fastening and anchoring tools and equipment.

The "Super Slugger" electric hammer operates on a new patented "Cushion-Snap" impact motion which eliminates kick, direct vibration and operator fatigue. It weighs only seven and one-half pounds but delivers 3,000 positive blows per minute.

Descriptive literature on "Super Slugger" and its line of tools for various job applications is available from Tempo Products Co., 1900 Euclid Ave., Cleveland 15, Ohio.

C & D Batteries, Inc. Opens Milwaukee Office

ROBERT COURTNEY, who for many years worked with Hugh Kelly, C & D's Chicago representative, has opened an office in Milwaukee, Wis., under the name of Batteree Co. His office is located at 5625 W. Wells Street. He will offer sales and service facilities for all types of C & D Batteries, covering the states of Minnesota, Wisconsin and the upper Michigan peninsula.

New Product Briefs

SOLDERING: Invention that hastens time required to replace soldering iron elements has been announced by *Hexacon Electric Co., 264 West Clay Avenue, Roselle Park, N. J.* The quick-change terminal can be removed in seconds, state the makers. This means that the heating element can be replaced in a fraction of the time usually required. Contact the company for further information.

STROMBERG | CARLSON

transmitter

Published by the makers of famous XY Equipment

VOL. 2, NO. 1, APRIL, 1953

Twin Versus Single Contacts

By R. H. Seibert, Engineer-in-Charge, Test Engineering

Twin contact combinations are found on relays and switches used in the most modern designs of switching equipment. The "A" type relay, used in the XY Dial System and in other apparatus manufactured by the Stromberg-Carlson Company, is equipped with twin contacts throughout. In addition, the universal switch of the XY System is equipped with twin contacts in the off-normal, overflow and release spring pileups and the bank wipers.

Twin contacts find application because of the increased reliability obtained by their use. Today, the operating companies and the using public insist upon higher grades of service from the telephone plant than ever before. Even in the step-by-step systems, in the past generally free from the difficulties caused by common control equipment, the advent of automatic toll ticketing has made the system dependent upon the precise operation of common control apparatus. Intertoll dialing demands that all of the circuits in an office be as completely reliable as possible so as to reduce the necessity for the operator to drop the switch train and start over because of individual contact failure. Maintenance costs are always an important item in the operating company's budget.

The application of twin contacts in the switching equipment favorably affects all of these items.

Contact Failure Probability

The probability of failure of contacts is not directly calculable. It can be established only by reliability tests containing a sufficient number of representative samples operated under controlled conditions many millions of times.

Definitions

The following definitions apply for this article:

Single contact combination: A pair of telephone type relay springs having only one contact per spring which is effective in making or breaking an electrical circuit.

Double contact combination: A pair of single contact combinations wired in parallel.

Twin contact combination: A pair of telephone type relay springs, each having two contacts arranged to make or break an electrical circuit approximately simultaneously. Generally, at least one of the springs is bifurcated and each tine is equipped with a single contact.

Contact Reliability

The factors which affect contact reliability are: contact pressure, contact wipe, contact material, contact shape and surface conditions, orientation in space, cover design and size, type of load switched by contact, atmospheric conditions (including dust, humidity, temperature, chemical makeup of atmosphere, pressure), circuit voltage (contacts open, contacts closed), and dust generated by abrasion of moving parts.

Contact Reliability Tests

Fowler[1] has investigated the probability of failure of single contact combinations. From the data taken in this investigation the probability of failure of double contact combinations has been calculated.

When discussing contact reliability it is necessary to confine the discussion to failures of contacts only, and to exclude all other mechanical and electrical failures which may result in contact failure. With this as a premise, there seems to be no valid reason why the data taken may not be applied to Stromberg-Carlson "A" Type relays.

The conditions present during the tests were more severe than any encountered during normal exchange operations. It is assumed, therefore, that the results describe the worst probabilities to be expected.

Single Contact Reliability

Probable number of failures of #18 *B & S gauge spherically tipped silver alloy contacts per million operations*:[2]

Contact Pressure (Grams)	Failures/Million Operations
35	1.46
30	4.30
20	88.
17.5	200.
15	427.
5	9000.

Double Contact Reliability

The probability of failure of the pair will be the product of the probability of failure of the single contacts. If this is reduced to per million operations, the following will be the result.

Probable number of failures of two #18 *B & S gauge spherically tipped silver alloy contacts connected in parallel (double contacts)*:

Contact Pressure on each Contact (Grams)	Failures/Million Operations
35	.000002132
30	.00001849
20	.007744
17.5	.04
15	.18232
5	81.

Ratio of Probability of Failure, Double versus Single Contacts:

Contact Pressure per Contact (Grams)	Ratio of Failure Probabilities
35	684,803
30	232,243
20	11,363
17.5	5,000
15	2,338
5	111

The Contact Pressure of Single and Twin or Double Contacts

Analysis of the preceding data indicates that it is desirable that both contacts of a double or twin contact combination should have the highest pressure possible. While it is not always true, it generally may be said that the higher the contact pressure on a given relay, the lower the sensitivity will be. It is thus necessary that a compromise be adopted which will allow satisfactory contact reliability without too great a decrease in sensitivity. Unless special relay designs are adopted, this generally means that the total contact pressure of twin contacts cannot exceed that of a single contact.

The practical comparison to be made between double and single contacts is, therefore, one which relates the reliability of a single contact combination at a given contact pressure to that of a twin or double contact combination at the same total pressure. For example, the probability of failure of a single 30 gram contact of the type investigated is 4.3 failures per million operations. The probability of failure of a double contact having 15 grams per contact is .18232 failures per million operations. Dividing 4.3 by .18232 to obtain the gain in reliability resulting from the use of double contacts gives:

$\frac{4.3}{.18232} = 22.7$ = A gain in reliability by 22.7 times.[3]

If the contact pressure could be increased to 35 grams in both cases, the double contacts would produce a more favorable gain in reliability.

$\frac{1.46}{.04} = 36.5$ = A gain in reliability by 36.5 times

Twin Contacts

Twin contacts may be expected to produce a smaller reliability gain in comparison to single contacts than do double contacts. The effectiveness of a twin contact in duplicating the action of the double contact depends upon many factors, including the mechanical characteristics of the twin contact springs, the form of the springs, the amount of "follow" of the springs after contact closure and the tolerances allowed in adjustment of the tines on the bifurcated springs. It is likely that a more detailed study would reveal additional factors. The twin contact springs used on the "A" Type relay duplicate the most reliable practical design of twin contact springs, and the reliability may be expected to approach that of double contacts.

Conclusion

From the evidence illustrated and referred to in this article, it is not possible to draw a completely fixed conclusion about the relative reliability of twin and single contact combinations. From the results of the tests one concludes that twin contacts having a pressure of 15 grams per contact will provide a reliability somewhat less than 23 times the reliability of single contacts at 30 grams. For twin contacts having 17.5 grams per contact the reliability ratio is increased to a possible maximum of 36.5 times when compared to single contacts at 35 grams.

The "A" Type relay is equipped with well designed twin contacts having a total pressure averaging 32.5 grams which permits a possible maximum reliability gain ratio of 33.7 to 1. when compared to single contacts. The maximum absolute reliability is approximately .2 failures per million operations.

If the tests had shown the single contacts to be only a bit more reliable at a pressure in the neighborhood of 30 grams, the gain resulting from the use of twin contacts would have increased and may have exceeded the 54 times estimated by Holm from unknown data. This is probably the actual case in average exchange operation since the reliability tests made by Fowler were conducted under very severe conditions.

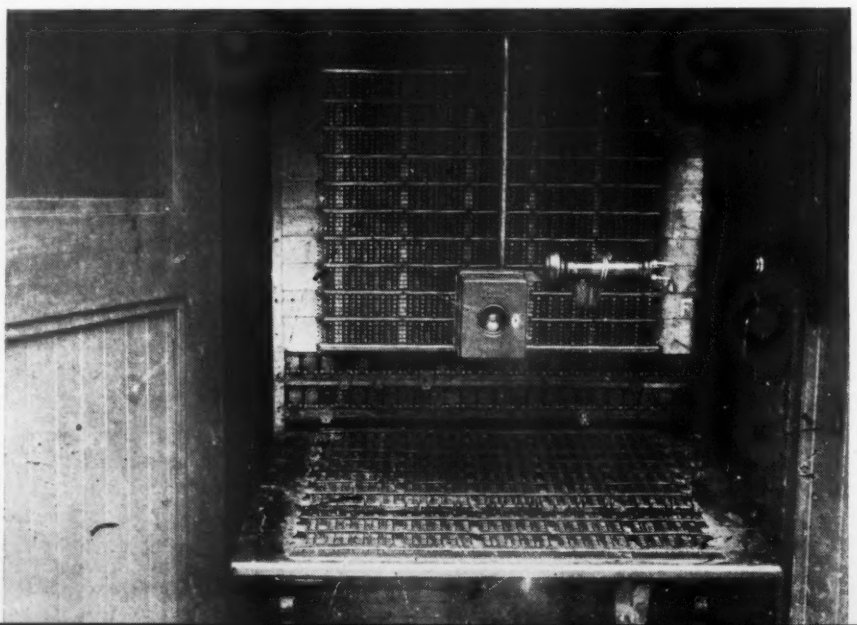
An additional point for consideration in the matter of contact reliability is the adjustment practices allowed and recommended by the manufacturer. When in proper adjustment, all "A" Type relays have a minimum of 25 grams contact pressure per pair of twin contacts regardless of application. This practice assures that the benefits available from twin contacts actually exist in each "A" Type relay.

1. *R. R. Fowler, A Study of Electrical Contact Reliability. The Strowger Technical Journal, pp. 9-16, June, 1937.*
2. *Revised from data by R. R. Fowler, Op. Cit.*
3. *This figure is not in agreement with Holm, who estimates a gain of 54 for the same conditions. See Electric Contacts, by Ragnar Holm, pg. 346. Holm's data probably represents average exchange operation more closely than this data.*

ANCIENT NOVA SCOTIA BOARD

Thank you, Mr. A. H. Skinner, for sending us this photo, taken in the summer of 1894 at Amherst, Nova Scotia. Mr. Skinner was sent there at that date to be Manager, trouble man, lineman and night operator. We are sure Mr. Skinner — Ex-Wire Chief of the South Penn Telephone Company at Waynesburg, Pennsylvania — has wonderful stories from his long experience in the telephone industry.

Does anyone else want to enter an *old* photograph?



STROMBERG-CARLSON transmitter

He's Senior Partner In Telephone Dad-Son Act

Irving Todd (left), secretary-treasurer of the Hastings (Minn.) Telephone Co., and Fred Pfaender, president of the New Ulm Rural Telephone Co., test a new development at recent Minnesota Telephone Association convention. Mr. Pfaender, whose career began in 1905, liked the industry so well he brought his son up to follow in his footsteps.

His hopes were well founded. Today his son, W. J. (Jim) Pfaender is manager of the Chicago Branch of the Stromberg-Carlson Company.

Photo courtesy Minneapolis Star Tribune.

Friendship is one of the world's most valuable assets, and should be cherished as such. To receive an unsolicited letter from a friend and customer, such as the one below, is indeed gratifying. It proves that the business of selling, when backed by performance of the product itself, is the responsible salesman's greatest satisfaction.

J. Tommy Thompson

Arlington Telephone Co.
Blair Telephone Co.
Citizens Telephone Co.
Central Nebraska Telephone Co.
Eastern Nebraska Telephone Co.

HUNT TELEPHONE PROPERTIES
GENERAL OFFICES LOCATED AT
BLAIR, NEBRASKA

Northern Telephone Co.
Penca Telephone Co.
Public Telephone Co.
Standish Ind. Telephone Co.
Union Telephone Co.

February 28, 1953

Mr. T. C. Thompson,
Stromberg-Carlson Company,
100 Carlson Road,
Rochester, New York

Dear Tommy:

It has been just three months since the cut-over of our new 700 line XY dial office here in Blair and I thought you would like to have a report on its performance.

Subscriber acceptance was enthusiastic and immediate. I have interviewed dozens of customers and, without exception, they have high praise for the service.

During the month of February we have had only two cases of central office trouble, both of which were of a minor nature. In fact, the trouble has been far less than I had expected with switch type equipment.

Our plant personnel are especially pleased with the flexibility of the Stromberg terminal-per-station four wire switching plan. I don't know of another system on the market that offers such flexibility in subscriber re-grouping without number changes. For example--two weeks ago we received an order for a subscriber install in a certain section of town. This called our attention to an inefficient use of cable pairs, brought on by years of past changes and moves. Without going into detail the following is the result of the re-grouping.

One more subscriber was served
Two cable pairs were recovered
One central office line equipment was recovered
An additional party line vacancy was created

All this was done without number change or inconvenience to the subscribers. With the high cable costs of today this ultimate in flexibility becomes extremely valuable.

Summing it all up we are well pleased with the equipment, and I believe that we have purchased the best that is available today.

Sincerely yours,

BLAIR TELEPHONE COMPANY

Robert C. Hunt

Robert C. Hunt

MEET Lewis Freeman

I wish you could all meet and chat with Lewis C. Freeman, Chief Draftsman, as I have over the years; his story is fascinating. "Lou's" first toy was an old magneto telephone — you see, his father was Supervisor of Telephone, Telegraph and Signals for the Pennsylvania Railroad, maintaining the railroad's own private system. Many were the moves, up and down the "Pensy" right of way, and this perhaps made it natural for Lou to follow the urge which all of us have to visit and know distant places.

At Carnegie Tech Lou received the last diploma awarded in Electrical Equipment and Construction. Joining the Union Switch and Signal Company, he became a member of the Superintendent's staff.

Came the Crash, and a ship at dock flying the Blue Peter. Lou embarked for Argentina as a wiper, docked as chief electrician. Several years and dozens of ports later found him inspecting electrical equipment on the S. S. America, then a-building at Newport News. This luxury liner had the latest type switchboard and a telephone in every room; Lou can testify to its effectiveness on the maiden voyage. Later, when converted to the U.S.S. West Point, the communication system was broadened to include sound-powered telephones (fire control to gun stations, etc.) and other means for communication and alarm.

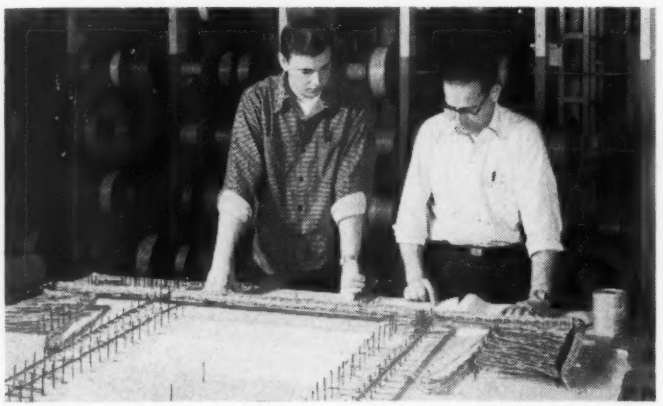
While working on plans for the "Santa" ships (Grace Line), Lou became acquainted with Stromberg-Carlson through the Dial Switchboards and Sound Systems being installed. In 1946 he became chief of the dial section of Stromberg-Carlson's drafting department and soon after was made chief draftsman. The circle back to telephone was complete.

As Lou puts it, "In 1949, having designed and built a home, I stocked it with a wife—Orpha Rafferty of Rochester—and now Sharon Marie, 22 months." Lou's interests are many, but closest to his heart are game fishing and hunting.

STROMBERG-CARLSON transmitter

FACTORY TRIP

One glance at the pictures and every telephone man will know immediately where George Forbes, your editor, is taking you this month. In the Cable Form section of the Switchboard Dept. are craftsmen who perform the most vital single function in bringing calling and called party together. Installers and service men alike depend on 100% accuracy and skill. Once the cable is laced, it *has* to be right.



As I take visitors through the Stromberg-Carlson main plant, one spot never fails to draw the "Ahs!" and "Ohs!" Non-telephone people just can't believe it when they see the maze of multicolored wires formed up into manual switchboard cables of many sizes and types.

"How do the workers know how to do it? And how do the assemblers know how to find the right wires to connect?"

I asked the same questions of Joseph Schwan, Supervisor, just to start the conversation. Let's watch Joe (top right) as he instructs one of the newer men in the running of an XY shelf cable.

A cable from drawing, to exact scale, has been made on heavy paper; nails are driven for each turn and at the points where leads are broken out. Running lists specify colors, as an aid to identification. Normally, battery and ground wires are run first, then pilot and circuit plate leads are required, and lastly, multiple wiring. To improve efficiency, colors are grouped where possible. Craftsmanship enters the picture in knowing just how tight to draw the wires, and in lacing to achieve an even contour.

Leon Richardson in the Engineering Dept., has charge of making the cable form drawings and running lists. He pointed out the importance of correct lengths and break-out points where 1/8" variation could cause trouble when the cable is wired into the board. He also showed me how in many cases the cables are split and the two sections piled up under the keyshelf to provide compactness for easier operation.

Al Bingley, Art O'Hanlon, and Dick Reynolds were working on manual cables as I dropped by.

"Do you have to buzz out these wires?" I asked Al. He mentioned his twenty-four years' experience in seeing that the right wire got to the right place. "But we do have to watch for kinks in the wire itself," he told me. This is principally a matter of trained fingers, to spot the kink as the wire is pulled off the reel.

"Manual cables are the real challenge," Art volunteered. (He's been making them for 10 years, and speaks from experience.) The cable is made on a flat table (one plane), but in use they run in multiple planes and in addition must allow for free swinging of relay gates and keyshelves.

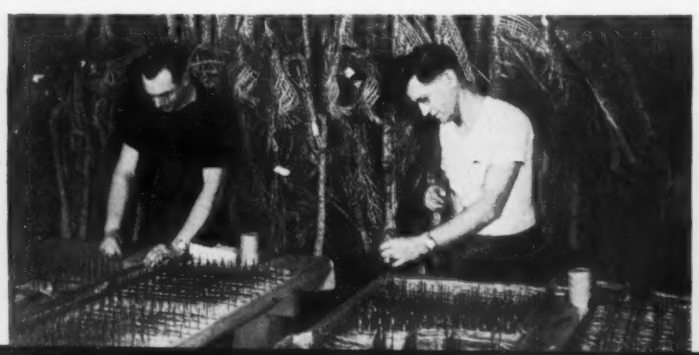
Norman Ross, who came to Stromberg-Carlson 43 years ago, pointed out the difference between today's production methods and the early years when one man wired-up a switchboard point-to-point, working directly from the job specifications.

"What do you consider a *big* cable?" I asked Joe Schwan.

"One that I remember," he reminisced, "used over 75,000 wires and weighed over 150 pounds. If you laid all that wire out, it would run about eight miles."

Production has improved with new methods, but here in the Cable Form section we still see old-time craftsmanship and pride in one's work.

Skilled hands follow a manual switchboard cable from drawing, represented by nails driven into table top. In background are finished cables.



Reels directly behind layout tables hold many gauges and types of wire in ten or more distinguished colors.

STROMBERG-CARLSON transmitter

The Drafting Department

Lewis C. Freeman, Chief Draftsman, discusses a point with his two Group Leaders — William McDowell (left), Apparatus Drawings and Archie Barragato, Circuit Drawings.

Russell Smith has worked in closest collaboration with the engineers in proving out the designs for the 1400 Series Telephones. Incidentally, Russ designed and built his own home.

Stromberg-Carlson drawings, over the years, have had an enviable reputation for clarity and above-average delineation. Many have been selected for use in textbooks on draft practice. Concurrent with placing the XY System on the market, new methods as well as more people were required to produce the greatly increased volume of drawings. This is, then primarily a story of what happened during the last few years.

All affected departments have had a hand in the evolution. The Shop has indicated preferred practices in production drawings for modern fabrication methods. A compromise was made with artistry for the sake of greater efficiency. The engineers have let the drafting room designers take over the function of creation, once the original idea has been established. The Blueprint Department was called upon for modern reproduction processes to aid the draftsmen. An example is the negative stripping method, when drawings need to be opened up to make additions.

Within the Drafting Department we find innovations: the electric eraser; all drawings made directly in ink on cloth, for greater permanence; use of marathon pens; templates of all standard symbols (the hours required to draw a fully-equipped two-wide circuit plate have been reduced 300%); and a full-sized light table, to mention a few.

Valuable time is saved by "researching" a multi-use item only once. A bracket, a Make-Busy and Test fixture, a potentiometer, standard hardware and similar items are sketched and filed in the reference library. Cross references by number and description make it easy to find the necessary information for a subsequent use.

The Stromberg-Carlson Power Board is an example of the new rapprochement between drafting and engineering. The original idea and electrical specifications were developed in Engineering; the mechanical layout was the product of the Drafting Room.

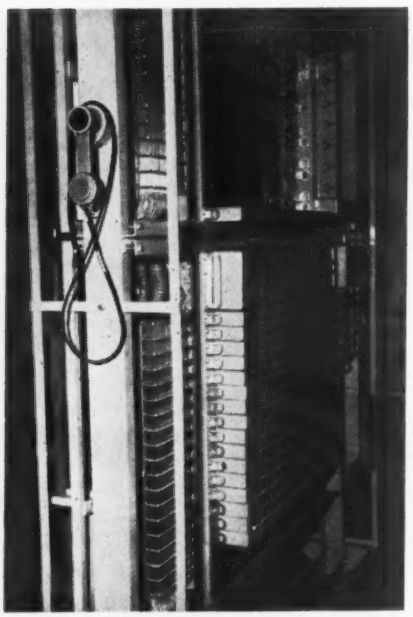
For greater efficiency the department is divided into two main sections. Circuit plates and diagrams, wiring and trunking drawings, and the like are made in the gorup headed by Archie Barragato. Archie had his formal education at the University of Rochester and brings 20 years experience in the field of power and networks to his job. "Mac" McDowell, educated at Alabama Polytechnic Institute and with 16 years in mechanical design and structures, heads the group working on equipment, apparatus and job drawings.

The Drafting Department does its best to live up to its motto: "Each Drawing is a Silent Salesman."

Robert Roselle works out a new circuit drawing. Standard symbols have been adopted to simplify reading in the field.

STROMBERG-CARLSON *transmitter*

Melcher-Dallas, Iowa, Enjoys Its XY Dial



A portion of the XY equipment room at Melcher.

Earle Bellamy, President, Frank Dixon, Wire Chief, James Bellamy, Sec.-Treas.

Earle Bellamy, his brother James, and Frank Dixon, have brought modern dial service to their subscribers in the Melcher-Dallas area.

In late 1951 engineering studies began — in the intervening time the complete plant, inside and out, has been converted from magneto direct to Stromberg-Carlson XY dial. At present there are 180 lines equipped; these can readily be expanded to 400.

The Bellamy Telephone Company, founded in 1898 by Mr. J. S. Bellamy (grandfather of today's president) at first included both electrical and telephone service. In 1925 the electrical system was sold to the Iowa Power and Light Company.

3600 subscribers are served by this company in the Melcher-Dallas, Lovilla, Pleasantville and Knoxville exchanges.

Much credit goes to Frank Dixon and his able assistant Harold Cecil for the detailed planning and the ease of transition from Magneto to Dial operation. As stated in the *Melcher Union*, "The foresight of the early pioneers and the spirit and desire of the present day operators have given this community the best possible service today."

XY-PBX at Camas, Wash.

"This more-than-human machine does everything but send out the telephone bills."

This from West Coast Telephone Company's O. M. (Dick) Huycke, in describing the Stromberg-Carlson XY-PBX equipment recently cut into service at the Crown Zellerbach paper mill in Camas, Washington.

In the picture we see Mr. Huycke, combination man-in-charge at the Camas mill, routining the switching equipment. In the left foreground is a portion of the Power and Supervisory panel — built up in standard units.

Dial phones are not entirely new to the Camas area, but the present service is a far cry from the old-type magneto instruments which formerly linked the wood mill to the front office.

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U. S. STEEL, COAL CHEM. DIV.
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THE BACK OF THE BOOK

By JOHN G. REYNOLDS

The Answer: Providing telephone service to new customers can't be compared to just tapping a water main or connecting to a high power electric line. Each new telephone must be connected by wires and cables to switchboards or dial switching equipment in a central office to provide for prompt inter-connections with every other telephone. Many months are required to engineer, manufacture and install all these facilities needed to meet the individual requirements of each new customer.

THE TELEPHONE COMPANY IS SURE LETTING US DOWN. TWO MONTHS IN OUR NEW HOUSE AND NO TELEPHONE YET!
YEAH, HOW ABOUT THAT? AND WE GOT WATER AND ELECTRICITY RIGHT AWAY WHEN WE MOVED INTO THIS NEIGHBORHOOD.
WHAT'S WRONG WITH THIS PICTURE?
The Monitor

Gremlins Get Kremlin Call

MOSCOW is as close as your telephone if you have leather lungs and the patience of a kindergarten teacher. The *Chicago Sun Times* made this discovery when its reporter placed a call to the Kremlin to learn more details about Stalin's illness.

The Chicago operator advised that "it might take four days—then again, 20 minutes." A Russian-speaking reporter was asked to stand by a telephone in the *Sun-Times*' city room.

Once the attempt was abandoned—temporarily. Then the call was placed again. There was a brief flurry of exchanges between the *Sun-Times*, a Chicago operator and an overseas operator in New York.

"The Kremlin number is 123," the newspaper was told. "There is no answer." "Keep trying."

Soon the city desk telephone buzzed a little louder than usual, it seemed.

"Ready with Moscow . . ." "Hello-hello—is this the Kremlin?"

An English-speaking male voice came through clearly: "I say—I can't hear you. Will you speak up?"

"IS THIS THE KREMLIN?"

"The Kremlin? This is the Canadian Embassy . . . *Chicago Sun-Times?* . . . My name . . . no, no . . . don't use that . . . just an embassy secretary, you know.

"About the Premier? Nothing new here . . . Why don't you try the American Embassy? . . . If you're calling Ottawa any time, give them my best . . . my home base."

Finally, the *Sun-Times* reached the American Embassy. The woman switchboard operator there, speaking English with a Russian accent, put an embassy secretary on the line.

He, too, pleaded that his name not be used.

"All we know here," said a man with a youngish voice, "is the original announcement that came over the radio . . . Reaction of the man on the street? I haven't seen one . . . haven't been out of the embassy since the news broke.

"Speculation here as to who might succeed him? You people probably know more about that than we do. Nice chatting with you."

The charge for the two completed Moscow calls was $28—*plus* $7 *tax*.

We understand several Chicago papers attempted to get through to Moscow. The circuit normally is open to all calls between 9 A. M. and 11 A. M.—with only emergency and governmental calls going through at other times. However, with the opening of UN sessions and Stalin's illness, the press now is being allowed to place calls at any time. Calls placed to Russians are getting through to Moscow but one of these things is happening: (1) the circuit goes out; (2) the called party does not answer, or (3) the called party "is out . . . and we don't know when he'll be back." Papers placing calls have been getting regular reports from overseas operators. Calls have been placed to Dr. A. F. Tretyakov, thought to be the chief physician; Molotov and/or "the Kremlin version of a press agent . . ." Calls placed to Americans (newsmen, U. S. Embassy, etc.) are going through.

Source Material

MOST TELEPHONE people know that the word "telephone" comes from two Greek words, "tele," meaning "far" and "phone" meaning "sound." Other words common in the business have equally interesting origins. For example:

Cable—from the Latin "Capulum" meaning "rope."

Insulator—from the Latin "insula," an island, or a thing "surrounded by" something else.

Copper—from the Old English "coper," which was from the Latin "cuprum," which in turn was taken from the Greek "kyprios," or the island now called Cyprus where the metal was popular in ancient times.

Dial—from the Latin "dialis" meaning "daily." It was applied to the face of a timepiece and the resemblance probably led to its use in telephony.

In The News . . .

AS PROOF OF strength muscle men have been known to tear a telephone book in half. Alex Endie, a professional golfer of the Shelter Rock Country Club on Long Island, however, knows a better trick than that. He once took a healthy swing and drove a golf ball through a Queensboro telephone book which was almost an inch thick. The ball plowed through both covers and 500 pages of the directory and went on for another 100 yards.

In Haverhill, Mass., a young man was fined $100 for reckless driving after his girl friend told police that when she refused his marriage proposal he replied: "O. K., you asked for it," and rammed a telephone pole. . .

The Answer Is YES!

WESTERN UNION

1201

DL=Day Letter
NL=Night Letter
LT=Int'l Letter Telegram
VLT=Int'l Victory Ltr.

W. P. MARSHALL, PRESIDENT

Time shown in the date line on telegrams and day letters is STANDARD TIME at point of origin. Time of receipt is 195 OCT

CTA136

.LRA178 NL PD=LORAIN OHIO 16=

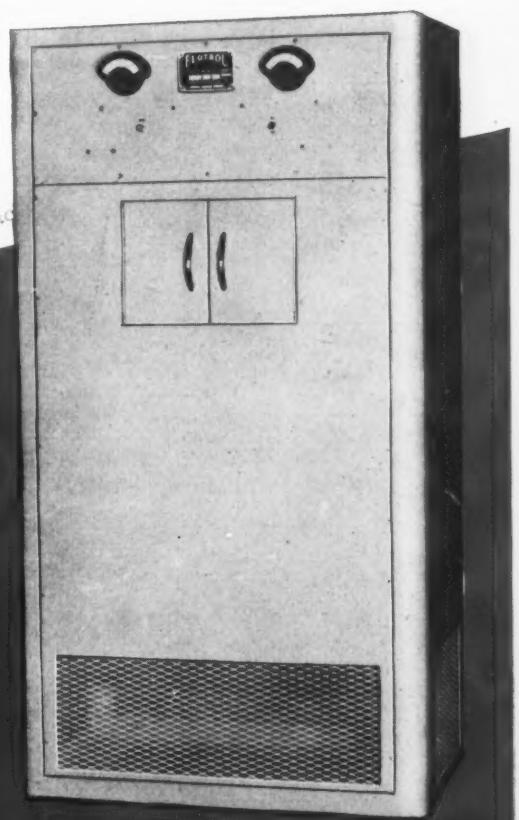
CENTERVILLE TELEPHONE CO=

CENTERVILLE NDAK=

YES, A THREE-PHASE FLOTROL WILL OPERATE IN PARALLEL WITH A MOTOR-GENERATOR SET. FURTHERMORE, IT WILL REGULATE THE CURRENT AND VOLTAGE OUTPUT OF THE GENERATOR. ORDER FLOTROL EQUIPPED WITH RESISTOR FOR PARALLELING WITH GENERATOR=

LORAIN PRODUCTS CORP
1122 F ST. LORAIN OHIO=

THE COMPANY WILL APPRECIATE SUGGESTIONS FR



MODEL 5 KB
100 Amps. 50 Volts

Now tried and proven, the combination of a FLOTROL with a motor-generator type battery charger may be the answer to your problem, too. By adding the proper three-phase FLOTROL to your exchange, you can maintain full-floating operation 24 hours daily, cut down the running time on your rotary equipment, provide adequate stand-by capacity, and realize sizeable savings on your monthly power bills. The equalizing feature installed in the FLOTROL will regulate the output voltage of your DC generator to the precise standard set by the FLOTROL and will divide the load current between the FLOTROL and the generator in proportion to their ratings.

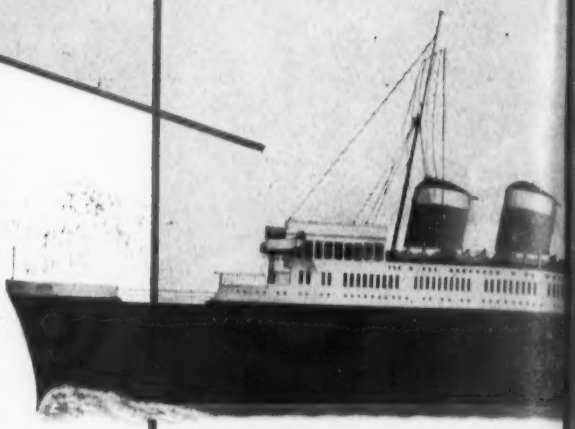
For complete information write for Bulletin 161 listing three-phase FLOTROLS from 25 amp. to 200 amp. Single-phase FLOTROLS ranging from 1 amp to 24 amp. are listed in Bulletin 160.

LORAIN PRODUCTS CORPORATION 1122 F ST., LORAIN, OHIO

FLOTROL
PARTNERS IN DEPENDABILITY
SUB-CYCLE

You have to be the best to be the leader

NEW TRANSATLANTIC SPEED RECORD SET BY LUXURY LINER ON MAIDEN CROSSING



The new super-liner, S.S. United States, eclipsed the transatlantic speed record on her maiden crossing by shaving 10 hours and 2 minutes off of the old mark. In doing this, she garnered the title for America for the first time in 83 years.

After the voyage, her Captain, Commodore Harry Manning, said that he felt "like a pitcher who had just pitched a no-hit game."

Since 1936, our organization has tried consistently to "break the record" by bettering past performances. Every year we have produced substantial increases in net profits to many telephone companies for which we publish directories.

Even though you may be relatively sure that the last issue of your telephone directory produced maximum potential net profit, we would appreciate an opportunity to make a thorough study of it for you. The results of our study will reveal whether your directory did produce maximum potential net profit for you, or whether by using our Complete Directory Service Plan we could produce more net profit for you from your directory operations.

Our representative will arrange to call upon you at your convenience. Simply telephone collect or write to our nearest office. No cost or obligation whatsoever.

GENERAL TELEPHONE DIRECTORY COMPANY

Our Complete Directory Service Plan includes all phases of directory publishing; sale of advertising, compilation, proofreading, paging, printing and preparation of directories for delivery.

GENERAL TELEPHONE SYSTEM

Nation-wide Publishers of Telephone Directories

Complete information available without obligation from our nearest office.

Des Plaines, Illinois
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VAnderbilt 4-2164

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604 Pine Avenue
Telephone 6-7221

Lubbock, Texas
1415 Avenue M
Telephone 2-6330

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